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Part Number: SWEISADB-MANREVA

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Printed in USA.

RADIO FREQUENCY INTERFERENCE NOTICE (USA)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and the receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

Note: If a Class A device is installed within this system then the system is considered to be a Class A system. In this case the following information applies:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Only peripherals (computer input/output devices, terminals, printers, etc.) which comply with FCC Class B limits may be attached to this computer product. Operation with non-compliant peripherals is likely to result in interference to radio and TV reception.

All cables used to connect to peripherals must be shielded and grounded. Operation with cables, connected to peripherals, which are not shielded and grounded may result in interference to radio and TV reception.

Quick Start Card For Experienced Users

If you have experience setting up a personal computer and you want to get started quickly, you can use the following guidelines to get up and running with your Swan computer.

Your Swan computer is shipped in one box, which also contains your keyboard, manuals, and miscellaneous hardware. Monitors are shipped separately. Your computer system should arrive with the following items:

- Swan computer
- Enhanced keyboard
- Power cord
- Video graphics card manual
- MS-DOS
- Two keys
- Miscellaneous hardware

If you purchased your Swan computer with a factory-installed video card and hard drive, you're ready to proceed; otherwise, you must first install these pieces of hardware. Refer to Chapter Eight of the *Swan User's Manual* for hardware installation information.

What You Need:
- A workspace near a grounded electrical outlet.
- A small blade screwdriver.

1. Unpack your system.

2. Make sure the main power switch located on the front panel is in the off (not depressed) position.

3. Attach the keyboard cable to the keyboard connector socket at the back of the system unit.

4. Attach the monitor cable to the appropriate video connector (Db9 connector for digital monitors, mini Db15 for analog monitors). Secure the cable connector.

5. Attach the female end of the power cord to the back of the system unit and the male end into a grounded power outlet.

6. Plug the monitor power cord into a grounded power outlet, and turn the monitor on. You may have to adjust the contrast and brightness controls after the computer is turned on.

7. Turn the system unit main power on by depressing the switch on the front panel to the right of the floppy drives.

8. Swan Technologies has preconfigured your computer with MS-DOS, so your system will boot when you turn it on.

If you need more information about starting your system, refer to Chapters One through Three of this manual. If your system did not boot properly, refer to the Troubleshooting section of the Technical Appendices.

Chapter One: Introduction

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1.1 Welcome

Congratulations on selecting a Swan EISA DB computer. These EISA DB systems feature the advanced technology of both EISA, which is advantageous for LAN servers, and local bus video for incredibly fast video in Windows and your other applications. This system is available as a 486SX/25, a 486/33, or a 486DX2-66. And the CPU is upgradable --the system board accepts Intel OverDrive™ upgrade processors. You're ready for the future too--the motherboard supports the forth-coming Intel OverDrive™ processor based on Pentium™ technology.

Extended Industry Standard Architecture (EISA) technology uses a 32-bit bus in the expansion slots on the system board, instead of the 16-bit standard of ISA. Yet all the slots are backward compatible, so they will support any 8-bit and 16-bit ISA cards. EISA technology opens up the Input/Output slot system allowing for advances in applications such as CAD/CAM and high-speed network servers. All seven slots are EISA, but two can also function as VESA VL-Bus local bus slots.

Using a video accelerator card in one of the two VESA® VL-Bus™ compatible local bus slots allows for outstanding video. The second local bus slot is available for other local bus peripheral adapters, like a hard drive controller or Ethernet card, and future applications.

The outstanding video performance of the EISA DB systems is achieved by having the video controller directly connected to the CPU via the local bus, removing the conventional bottleneck of the I/O channel. This Direct Bus architecture is 32-bit and runs at the same speed as the CPU, up to 33 MHz, which eliminates any wait states in video memory. Using Direct Bus video architecture and a video accelerator card, the Swan EISA DB computers give you incredibly fast video performance in all your applications—in both Windows and DOS environments. Everyday tasks like switching from one page to another in desktop publishing programs, screen scrolling in word processing programs, or switching windows in multitasking environments, will happen with speeds you've never seen before. Screen re-draws will be instantaneous, saving you valuable work time.

The Swan system board offers many performance advantages. For instance, it comes standard with 128 KB external cache, and is expandable to 512 KB! Using adaptive write-back architecture and most frequently accessed (MFA) caching algorithm, system memory is

accessed with the highest possible cache hit rate. And it supports full 486 burst mode, for even more speed. And these systems support up to 128 MB of DRAM on the system board. The board is made with using surface-mount technology and a higher level of chip integration, making it exceptionally reliable.

Although your Swan EISA DB system features EISA and VESA VL-Bus slots, it is also fully compatible with Industry Standard Architecture (ISA), which gives you the freedom to customize your computer with any of the expansion products and software available.

Every Swan system undergoes a uniquely rigorous testing and burn-in procedure, making it exceptionally reliable.

1.2 System Overview

A wide variety of configurations are available--too many to explore in detail here. Following is a list of features common to all configurations:

- Intel i486SX-25, i486DX-33, or i486DX2-66 Processor.
- 4 MB DRAM, expandable to 128 MB on system board.
- Secondary Cache with write-back architecture and full support for 486 burst mode cycles. 128 KB standard, expandable to 256 KB or 512 KB.
- Supports 80487SX coprocessor and OverDrive™ processors.
- Seven EISA expansion slots, including two VESA® VL-Bus™ compatible local bus slots.
- 200-watt power supply; 300-watt in optional vertical case.
- 101-key AT-style enhanced keyboard.
- Two serial ports, one parallel port.
- Slimline Dual Floppy drive, which includes both a 1.2 MB 5.25" floppy drive and a 1.44 MB 3.5" floppy drive.

1.3 Additional Documentation

Several companion documents are included with this manual:

Floppy/Hard Drive Host Adapter Manual

If you purchased your system with a Small Computer System Interface (SCSI) or an Integrated Drive Electronics (IDE) Host Adapter, this documentation is provided to tell you how to change the default settings of the host adapter card.

Swan Video Card Documentation

If you purchased your Swan EISA DB system with a factory-installed video card, this manual is provided to describe the features, modes of operation, configuration, and technical details of the video card. It also contains instructions for installing extended mode software drivers.

If you purchased the computer without a video card, or you requested a custom-configured video system, refer to the documentation provided by the video card vendor.

Swan Hard Drive Product Guide

If you purchased your Swan system with a factory-installed hard drive, this manual is provided to describe the configuration and technical details of the hard drive.

EISA Configuration Utility (ECU) Manual

The ECU manual is provided by the ECU manufacturer. It is packaged separately within the Swan User's Manual for your convenience. This documentation contains detailed information about the configuration utility for your EISA system.

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1.4 Common Terms

The following list is a summary of several basic terms used throughout this manual. The term which appears first in each section is the term used throughout.

Computer, System Unit, System, CPU, Main System, Machine: These terms refer to the rectangular case which contains the system board, disk drives, and power supply.

Monitor, Console, Display, Terminal: These terms refer to the display screen that is used to show the output of the computer.

Disk, Diskette, Floppy, Floppy Disk: These terms refer to the 5.25" or 3.5" magnetic storage devices used to store information.

Hard Drive, Hard Disk, Fixed Disk: These refer to a fast, non-removable storage device which is permanently mounted inside your computer.

Peripheral, I/O Device: These terms refer to any external Input/Output units and auxiliary storage units of your computer. These include monitors, printers, modems, keyboards, etc.

A more extensive list of computer terms and their meanings are found in the glossary near the end of this manual.

1.5 Notational Conventions

Throughout this manual, the following conventions are used to distinguish elements of text:

Courier	Designates screen text.
Courier	Indicates required user input.
<CR>	Specifies single keystroke, in this case "Carriage Return."
<Shft>G or <Ctrl><Del>	Indicates two or more keys should be pressed at the same time, in this case Shift-G or Control-Delete.
ALL CAPS	Indicates commands, paths, or filespecs.

1.6 About This Manual

To help you set up your computer as easily and efficiently as possible, the chapters of this manual are divided into areas of interest ranging from first-time installation to detailed technical information.

Chapter 1: Introduction--Presents an overview of your system and the use of this manual.

Chapter 2: System Setup--Includes instructions and illustrations to guide you as you unpack and connect devices to your computer.

Chapter 3: System Startup (MS-DOS)--Describes procedures for getting your Swan up and running under MS-DOS.

Chapter 4: Floppy Diskettes--Discusses basic concepts about diskette drives, the various types of diskettes and drives, and how to handle diskettes.

Chapter 5: Hard Drives--Covers basic concepts about hard-disk drives and physical and logical formatting.

Chapter 6: Video Systems--Addresses the variety of video standards, covering both video cards and monitors. Also discusses local bus technology and supported modes.

Chapter 7: Technical Information--Describes the processor, the EISA chipset, the cache system, main memory organization, and extended and expanded memory management.

Chapter 8: Upgrading Your Swan Computer--Describes the Setup utility, installation of additional hardware, main memory configuration, cache upgrading, installation of the upgrade processors, and the EISA and VESA VL slots.

Section S: The System Board--Describes the system board in detail, including diagrams, jumper settings, connectors, and system configuration.

Section T: Troubleshooting--Describes troubleshooting instructions and how to reach Technical Support.

Appendices A-J: Technical Appendices--Various technical appendices for reference.

Chapter Two: System Setup

2.1 Unpacking Checklist

Set up your computer on a flat surface, approximately 4 feet by 3 feet, at a comfortable working height and near a grounded wall outlet. Try to avoid outlets near large electrical appliances because these may adversely affect your computer's power supply. The environment should be dust-free and kept at a fairly constant temperature.

The Swan computer is shipped in one box, which also contains your keyboard, manuals, and miscellaneous hardware. Monitors are shipped separately. Your computer system should arrive with the following items:

- Swan computer,
- Enhanced keyboard,
- Two keys,
- Video graphics card manual
- MS-DOS,
- Miscellaneous hardware,
- Power Cord,
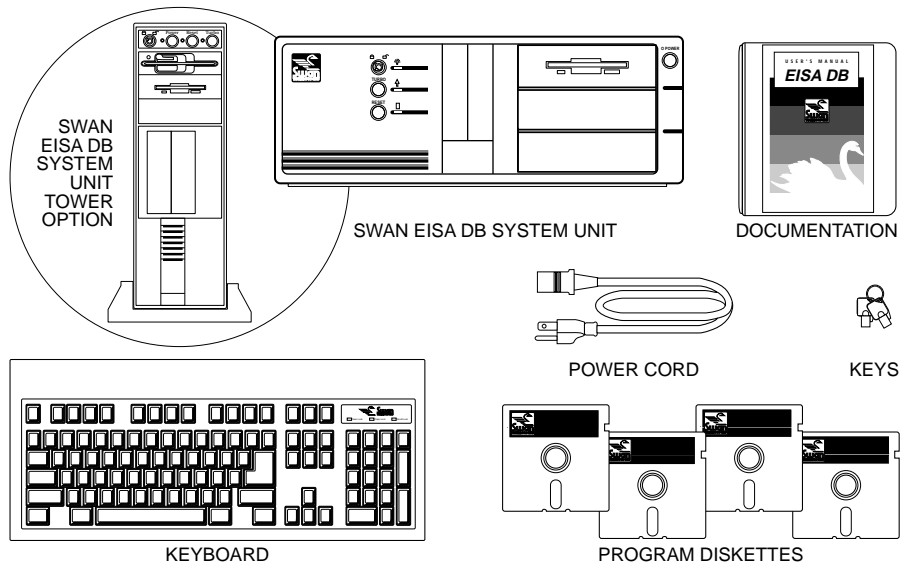
Figure 2.1 Unpacking the Computer

> **Note:** The packing material is designed to ensure safe transpor-
> tation of delicate components. Save all the packing
> materials in case you move your Swan.

2.2 Physical Features of Your Swan System

Your Swan computer features a baby AT desktop case (or tower option).
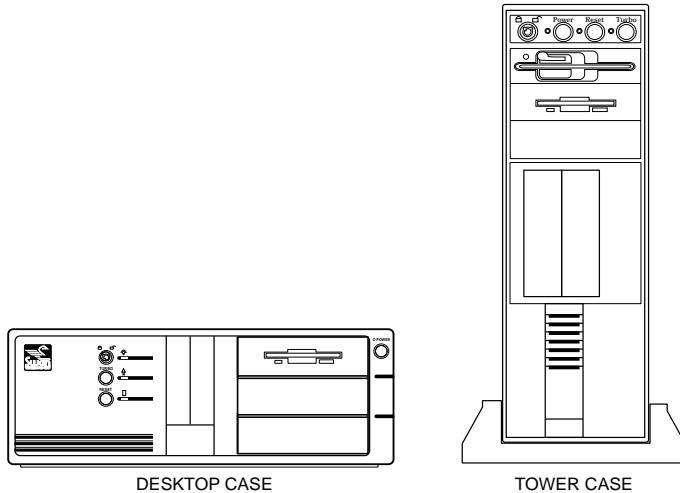
Figure 2.2 Front of Case Illustration

DESKTOP

TOWER
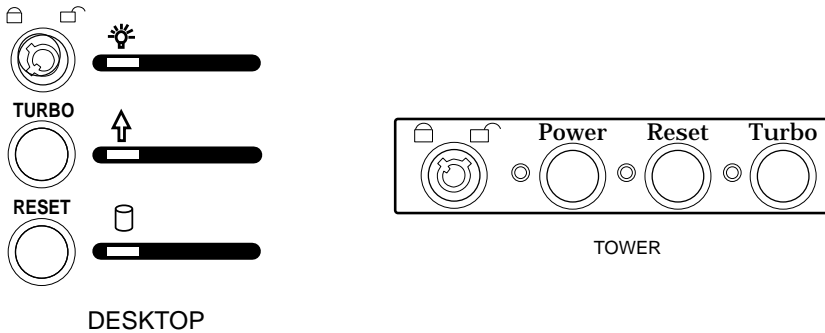
Figure 2.3 Detail - Control Panel

2.2.1 The Controls

The control panel on the baby AT desktop case includes three LEDs, a Reset button, a Turbo button, and a lock. The Power Switch is also located on the front of the case, on the right side. See Figure 2.3.

The Power Switch

Located on the right side of the front of the case, this switch is used to turn the computer on and off. When the main power to the computer is on, the power LED will be lit.

The LED Indicators

There are three Light Emitting Diodes, arranged vertically in the control panel. The first LED, at the top, (green) is a power-on indicator and should light immediately when you turn on your computer. The second one, in the middle, (yellow) is a turbo LED, which will be lit when the system is running in fast (normal) speed. The third LED, at the bottom, (orange) is a hard drive activity indicator; it is controlled by the hard drive controller, not the physical hard drive. If more than one physical drive is installed, this LED lights if either drive is accessed.

The Turbo Button

For maximum compatibility, this machine has been designed to run at speeds slower than the CPU. The turbo button will allow you to toggle the processor speed between fast (the CPU speed) and slow (roughly 8 MHz).

The Reset Button

An invalid command or a software bug may cause your computer to "hang" or "lock up"--your computer will not accept any input. The reset button initiates a **warm boot**, which resets the computer without interrupting the power supply.

Unlike a **keyboard warm boot** <Ctrl><Alt><Del>, a reset button warm boot performs Power-On Self-Testing (POST) and a memory count. The reset button does not interrupt power to the hard drive, although the drive resets as well.

The keyboard controller chip on the systemboard is a peripheral device to the computer and is not reset by a warm boot. In some instances, you must perform a **cold boot** to reset the keyboard controller by switching the power off and then on.

The Keyboard Lock

The lock on the control panel controls your keyboard. The lock has a tubular key which is difficult to duplicate. When the slot in the central post is lined up with the closed lock symbol, the computer does not recognize the keyboard. To unlock your computer, turn the slot in the central post until it lines up with the open lock symbol.

This feature is useful if access to the keyboard must be restricted (i.e., a network server).

_____

2.3 Cable Connections

Be sure your computer is unplugged before connecting any peripherals. A small, flat screwdriver is needed to secure some cables to your computer. Cables have connectors which plug into sockets, called **ports**, at the rear of your computer; these are almost always specially shaped (**keyed**) to prevent a misconnection.

If the cable doesn't fit the socket, don't force it--you may bend or break some of the pins in the connector. Remove the cable, check to make sure the connector is lined up properly and try again. The connector should fit securely but should not require a forced fit.

Connecting the Monitor

Be sure your computer is not plugged in. Place the monitor near the computer. Connect the monitor cable to the video card port.

If a video system other than the standard Swan Super VGA is being used, information in this chapter may not apply; consult your documentation for the specific video card and monitor.

There are two types of monitor power cords: those that plug into the wall and those that plug into the back of the computer. Plug the male end of your power cable into either the wall outlet or the back of the computer. Plug the female end of the power cable into the back of the monitor if the cable is not already connected.

Connecting The Keyboard

Your keyboard is compatible with either XT or AT class machines, depending on how you set the switch on the back of the keyboard. Before connecting your keyboard, be sure the switch is set to the AT

TOWER

CONNECT
MONITOR
HERE

120/240VAC SWITCH

SWITCHED OUTLET

POWER CORD

COM2 Db25M

CONNECT
KEYBOARD
HERE ► KEYBOARD PLUG

SCSI BUS CONNECTOR (OPTIONAL)

LPT1 Db25F

COM1 Db9M

CONNECT
PRINTER
HERE

VIDEO PORT FOR ANALOG
MONITOR Db15F MINI

CONNECT
MONITOR
HERE

CONNECT
MONITOR
HERE

DESKTOP

POWER
CORD

VIDEO PORT FOR
ANALOG MONITOR
Db15F MINI

COM1
Db9M

115/230VAC
SWITCH

CONVENIENCE
RECEPTACLE

COM2
Db25M

SERIAL
PORTS

KEYBOARD
PLUG

LPT1
Db25F

MODEM

CONNECT
MONITOR
HERE

CONNECT
KEYBOARD
HERE

CONNECT
PRINTER
HERE

Figure 2.4 Back of Case

position. If this switch is not set correctly, the computer takes an unusually long time to boot and produces a Keyboard Error message.

Connect the keyboard to the computer by inserting the keyboard cable into the round socket at the rear of the computer. The plug and socket are keyed--there is only one way they can be connected properly.

Connecting A Printer (Optional)

In order to connect a printer, you need to attach the printer's cable to either the parallel port or the serial port. Most printers connect to parallel ports. If you have a serial printer, follow the instructions supplied with the printer. If you have a parallel printer you may use the following guidelines.

The parallel port on the computer is a D-shaped 25-pin female connector (Db25F). To connect your printer, you need a standard parallel cable (Db25M to Centronics 36-pin male). The 25-pin end of the cable is connected to the computer's parallel port. The 36-pin end of the cable plugs into your printer. Both ends of the cable are keyed.

Network printers are a special case--the configuration of each is specific to the type of network in use. Consult your network documentation for details.

Connecting A Mouse (Optional)

There are two common types of mice: serial and bus. A serial mouse attaches to your serial port. A bus mouse comes with a card which plugs into an expansion slot on the system board. The bus mouse port and the mouse cable are both keyed. If your mouse is a bus mouse, refer to its installation instructions.

Connecting The Power Cord

Make sure the power is turned off. The computer comes with a detached power cord. Attach the female end of the cable to the back of the computer, and plug the male end into any standard (USA) grounded wall outlet.

> **Note:** We strongly recommend that you use a Surge/Spike protector to help safeguard your computer against any dangerous irregularities in the AC line.

2.4 Turning On The Computer

1. Turn on the monitor.

2. Turn on the computer.
   - When you turn the power switch on, the control panel power LED turns on and the screen is blank, except for a cursor.
   - A message is displayed on the monitor showing ROM version and copyright information, followed by a RAM count which tests memory size.
   - The floppy drive LEDs light, indicating the computer is testing for the presence of floppy drives.
   - The control panel hard drive LED lights, indicating the computer is testing for the presence of a hard drive.
   - The computer pauses briefly to conduct internal tests.
   - The drive A LED lights while the computer tests for the presence of a bootable diskette.

If your system boots normally, your screen will display a message indicating the version of the system BIOS. Then the screen is cleared and the version of MS-DOS is displayed above the command prompt. The computer is now ready to accept your commands.

Chapter Three: System Start-Up (MS-DOS)

This section is written for users with MS-DOS version 5.0. Consult your DOS manual for specific installation and operation instructions.

3.1 Booting

The process of starting up a computer is called **booting**. Swan Technologies configures your computer so that you only need to turn on your computer to be up and running under your Disk Operating System (**DOS**). The disk operating system is a vital component of a computer system, providing an easy-to-use link between you and your computer's resources. DOS sets the standards for application programs that run in it.

The program for the boot process is part of the Basic Input/ Output System **(BIOS)**, which is a set of detailed instructions for activating the peripheral devices. The boot routine in the BIOS is responsible for testing memory upon start-up and preparing the computer for operation.

The boot process is divided into task areas: a Power-On Self-Test **(POST)**, a memory count, a check for the presence of devices (**polling**), and the loading of the operating system. BIOS is built into a pair of Read-Only Memory **(ROM)** chips and is the only interface between the operating system and the computer.

The POST performs many hardware checks. If an error occurs, either a message appears on the screen or a beep code communicates information about the problem. The POST and its error messages are described in greater detail in Appendix I.

After the POST, the BIOS counts all of the Random Access Memory **(RAM)** available to the system. On a 4 MB system, the RAM count is separated into two parts: 640 KB of **base memory** (or **conventional memory**) which is used by DOS, and 3072 KB of **extended memory**. The memory above 640 KB and below 1 MB is used as **shadow memory**. Extended, expanded, and shadow memory are discussed in detail in Chapter 7. Your 4 MB system comes factory-configured with 640 KB base/384 KB shadow/3072 KB extended.

After the RAM count, the BIOS polling occurs. A special low-power Complementary Metal Oxide Semiconductor (**CMOS**) memory chip is used to store information about the computer, including the number and type of drives. BIOS compares the CMOS record to what the poll reveals. When the drives are polled, their activity LEDs light and their read/write heads move. CMOS information can be accessed with the Setup program, by hitting <Ctrl><Alt><Esc>.

After the polling process, the BIOS loads the operating system. The BIOS first checks for a bootable partition on drive A and then on drive C. Not all diskettes are bootable; if you have problems booting your computer, see Section T on Troubleshooting.

Once the computer boots, DOS displays a command line prompt, indicating that DOS is waiting for a command. Swan configures the computer so that the prompt displays the current drive and subdirectory.

3.2 The Keyboard

Your Swan computer comes with a 101-key AT-style enhanced keyboard, which includes the typewriter keypad, the numeric keypad, the cursor keys, and the function keys. The XT/AT switch on the back of the keyboard must be set to AT for the keyboard to operate properly.
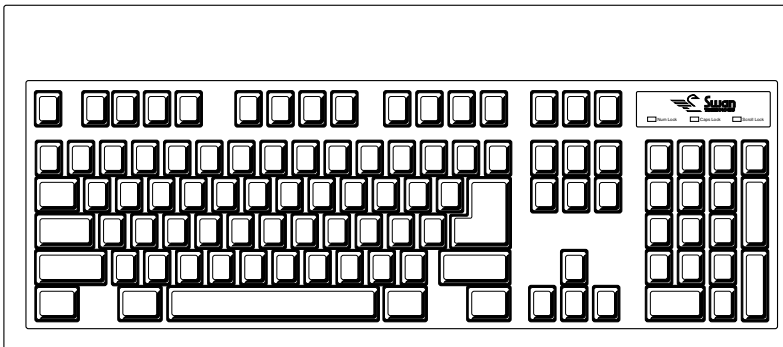
Figure 3.1 The Keyboard

The three LEDs in the upper right corner of your keyboard show the status of the Num Lock, Caps Lock, and Scroll Lock keys. A lit LED indicates an active function key. All three are toggle keys.

The Typewriter Keypad

In general, the keys in this area work the same as the corresponding keys on a typewriter, except that the Shift-lock key has been replaced by a Caps Lock key and the computer keyboard has Control <**Ctrl**> and Alternate <**Alt**> keys.

Caps Lock

This key shifts only the alphabet keys to upper case. Even if Caps Lock is on (indicated by a lit Caps Lock LED), you must still press a shift key in conjunction with the upper-row numeric keys to get the special characters. When Caps Lock is on, pressing a shift key and an alphabet key simultaneously yields a lowercase character. The Ctrl and Alt keys are modifier keys which you must press in conjunction with another key. For instance, holding the Ctrl key and pressing the M key (<Ctrl>M) sends the same signal to the computer as pressing the Enter key. Shift, Ctrl, and Alt allow a single key to be defined in many different ways. Most of these functions are defined by the software package you are using. Check with your software documentation for a complete listing of these key functions.

The Numeric Keypad

The numeric keypad was designed to allow rapid entry of numbers for equations, spreadsheets, or any application where numeric entry is important.

The Num-Lock key, at the top of the pad, is a toggle key which activates and deactivates the numeric keypad. If the Num Lock light is off, the keypad acts like a set of cursor keys. If the Num Lock LED is lit, the keypad can be used to enter numbers. (Note: The "+","-","*","/", and "Enter" keys stay the same regardless of whether Num Lock is on or off.)

The Cursor Keys

A **cursor** is a moving or blinking symbol that indicates where the next character will appear on the screen. It can take many different forms depending on the software you are using.

The Cursor keypad consists of four cursor movement (or Arrow) keys, two cursor location keys (Home and End), two window location keys (Page Up and Page Down), and two editing keys (Ins

and Del). The exact function of these keys varies depending on what software is being used, but they are usually defined as follows:

Arrow Keys move the cursor in the direction specified by the arrow symbol.

Cursor location keys move your cursor to a different location on the screen. **Home** normally moves the cursor to the left-hand side of the screen. **End** normally moves the cursor to last character on the line.

Page Up and **Page Down** are used to scroll pages forward and backward.

The editing keys are used to insert and delete text or graphics.

When the Num Lock LED is off, the corresponding keys on the numeric keypad duplicate the functions of the cursor keys.

The Function Keys

There are two types of function keys on your Swan keyboard: Programmable Function Keys (F1 through F12), and Pre-programmed Function Keys (Esc, Pause, Scroll Lock, and Print Scrn). The Programmable Function Keys assume many different meanings depending on the software you are running. The Pre-programmed Keys generally maintain the operations described below:

<**Esc**> exits a program or a menu level.

<**Pause**> alone temporarily halts the execution of a job; press any other key and execution resumes. <**Ctrl**><**Pause**> ends the program you are currently running; permanent loss of data may occur.

<**Scroll Lock**> locks the cursor to a specific column location on the screen; the cursor remains in this position when you use the scroll or arrow keys.

<**Print Scrn**> alone sends a copy of whatever is on your screen to your primary parallel port as output for your printer. <Print Screen> works if your printer is connected to the LPT1 device.

<**Ctrl**><**Print Scrn**> sends to the computer a system request signal which is typically read by multi-user, networking software. Under DOS, a system request signal is not used.

Hot Key Sequences

There are several key sequences called **hardware interrupts** or **hot keys** which send a special signal to the computer. This signal causes the processor to transfer program control to some specific location in main storage, thus breaking the normal flow of the program being executed. After the interrupt has been processed, program control is again returned to the program. The BIOS provides two very important hardware interrupts: <Ctrl><Alt><Del>, which performs a warm boot, and <Ctrl><Alt><Esc>, which executes the CMOS Setup program. System speed can be changed using the following hot keys: <Ctrl><Alt><+> will set the processor to run at normal (fast) speed and <Ctrl><Alt><-> will set the speed to slow (half the normal speed).

Hot Keys are created by Terminate and Stay Ready (**TSR**) utilities. TSR programs are RAM-resident programs that remain in memory at all times so that they can be instantly activated.

3.3 The CONFIG.SYS File

The CONFIG.SYS file is a configuration file that contains certain commands that MS-DOS checks when you boot your computer. Each time you start your computer, MS-DOS searches the root directory of the drive from which it was booted for a file named CONFIG.SYS.

With MS-DOS, the system is configured automatically every time you boot. For further details about the CONFIG.SYS file, refer to your DOS manual.

3.4 The AUTOEXEC.BAT File

The AUTOEXEC.BAT file lets you automatically run programs when you boot your computer. It performs any set of commands you would normally give when you start MS-DOS. When you start your computer, MS-DOS searches the root directory of the default drive for a file named AUTOEXEC.BAT. If it finds the AUTOEXEC.BAT file, MS-DOS immediately processes it.

With MS-DOS, the AUTOEXEC.BAT file is automatically run when you boot the computer. The installation of DOS 5.0 creates a default AUTOEXEC.BAT and CONFIG.SYS for you. For further details, refer to your DOS manual.

> Note: You may change the contents of the CONFIG.SYS file and the AUTOEXEC.BAT file with the utility EDIT--the MS-DOS 5.0 full-screen editor. Refer to your DOS manual for details.

Chapter Four: Diskettes

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4.1 Floppy Diskettes

A floppy disk is a flexible, magnetized plastic disk enclosed in a plastic cover. A double-density disk can store hundreds of single-spaced pages of text; a high-density disk can store considerably more. Floppies can be used to store files or programs or to back up files that are stored on the hard drive. They can also be used to transfer files from one computer to another if they aren't networked. When the computer writes data to a diskette, the data is stored on the diskette as magnetic impulses.

You should take several precautions when handling floppy disks to avoid damaging them. The front of a floppy disk is smooth and the back has visible seams.

- **Do** store diskettes in protective paper jackets.
- **Do** write on your labels with a felt-tip pen, not with pencil or ball-point pen.
- **Do** attach labels to the front of the disk.

- **Don't** bend diskettes.
- **Don't** touch the exposed magnetic surface of the diskette with your fingers or any object or pick up a diskette by its corner.
- **Don't** expose diskettes to magnetic fields by placing them on household appliances, televisions, phones, etc.
- **Don't** expose diskettes to extreme heat, cold, or moisture.

- If you have wool carpets, you may want to consider purchasing an anti-static mat to avoid damaging your diskettes with static electricity.
- If you have several disks, you may find it convenient to purchase a protective storage case for your disks.

4.2 Types of Diskettes

There are four different types of floppy diskettes:

Size	Capacity	TPI	Tracks /side	Sectors /track	Bytes /sector
5.25"	360 KB	48	40	9	512
5.25"	1.2 MB	96	80	15	512
3.5"	720 KB	135	80	9	512
3.5"	1.44 MB	135	80	18	512

These floppy diskettes come in two different sizes: 5.25" and 3.5", and each size is available in two different capacities--high-density and medium-density. A high-density 5.25" diskette can store 1.2 MB of information, and a high-density 3.5" can store 1.44 MB of information. The medium-density 5.25" and 3.5" diskettes can store 360 KB and 720 KB respectively.

High-density and medium-density diskettes, of either size, are very similar in appearance, and difficult to distinguish. Below is an illustration which shows how to tell them apart.
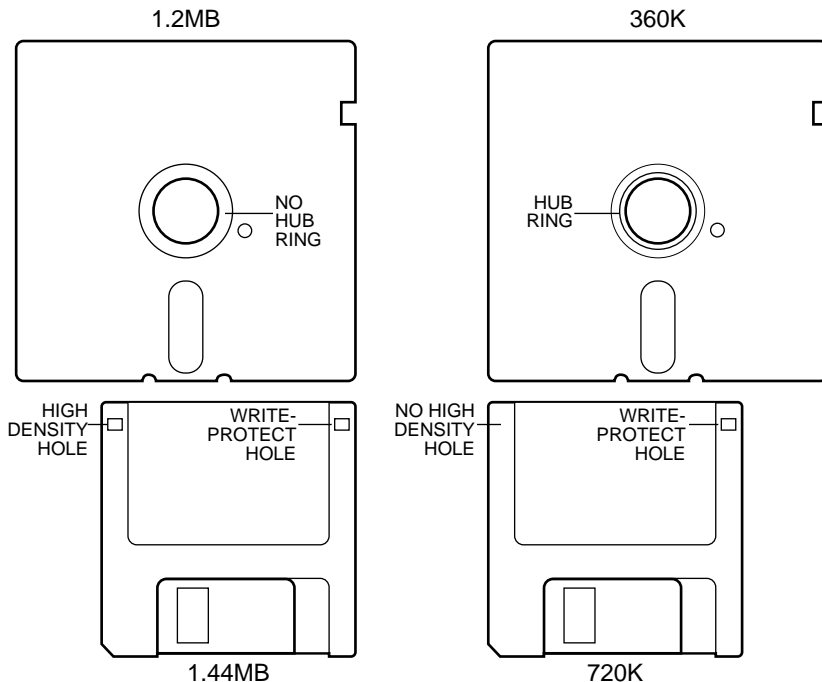
Figure 4.1 Types of Diskettes

4.3 Drive Designations

The computer recognizes the top floppy drive in your computer as drive A; if you have an additional drive, the computer recognizes it as drive B. The computer recognizes your hard drive as drive C.

The prompt which appears when you turn on your computer indicates which drive is the default drive. The default drive is where the computer automatically looks for your program files.

To change the default drive, type the new drive letter followed by a colon then press <Enter>. For example, if your default drive is A, the prompt appears like this: A:\>. To change the default drive to B, type: B:<Enter>.

For more information about prompts and default drives, refer to your DOS manual.

4.4 Formatting Diskettes

Before you can use a diskette to store data, you must **format** it. FORMAT is a special program that structures the tracks and sectors on a diskette so the computer can store and find information on it. The FORMAT command also checks the disk for defects. You can format both floppy diskettes and hard drives.

> **Warning**: Formatting a disk destroys any data already on the disk.

Please refer to your DOS manual for details on formatting diskettes.

Chapter Five: Hard Drives

5.1 Hard Drives

A hard drive is typically an enclosed set of metal disks (**platters**) which are coated with magnetic recording surfaces. Hard drives provide large-capacity, high-speed random access storage for programs and data. They come in removable and fixed varieties which hold from 30 MB to over one gigabyte. Used as main storage, hard drives can dramatically increase the efficiency of your computer.

The term hard drive is derived from the support for the rigid platters used in the storage device. IBM calls them "**fixed disks**" to distinguish them from floppy diskettes, which are removable. The term "**Winchester**" is occasionally used to describe hard drives because the first of them used a head assembly developed at IBM's Winchester laboratory.

Hard drives have several advantages over floppy diskettes. While both hard drives and diskettes store data, hard drives have a much higher storage capacity than diskettes. A 150 MB hard drive can store the equivalent of about 125 high-density 1.2 MB diskettes.

The time required to find stored data and load it into a computer's memory is called **retrieval time**. A hard disk spins faster than a floppy disk, so it has a shorter retrieval time. Two important factors which determine retrieval time are **access time** (the time it takes the hard drive to locate the information) and **data transfer rate** (the time it takes to transfer data from the storage media to memory).

> **Important:** We strongly recommend that you back up your hard drive regularly to help safeguard your data against accidental loss. For more information on backing up your hard drive with DOS, refer to the information on BACKUP and RESTORE commands in the *MS-DOS User's Reference*.

In order to make the best use of this chapter, you may want to familiarize yourself with the following terms.

Access Time: A measure of the time required for a drive to find data on the media, starting when a seek instruction is issued by the controller and ending when the beginning of the requested data is under the heads.

Access time depends on the mechanical devices in the drive such as the actuator, a motor-like device which moves the heads to the proper position and waits while the heads stop vibrating (ringing) from the sudden acceleration and deceleration.

Another component of access time is **rotational latency**, or the amount of time it takes for the disk to rotate until the required location on the disk is positioned under the read/write head.

Access times are usually split into two categories: sequential and random. **Sequential access** measures the time necessary to seek to an adjacent cylinder. **Random access** is a statistical average of the time necessary to perform a number of random seeks over the entire surface of the platter.

Cylinder: One of the concentric, ring-shaped data-storing areas on a platter. A cylinder is usually less than a millimeter wide. Cylinders are also called **tracks**.

Data Transfer Rate: This is the rate at which data is moved from the drive media through the controller and into memory, once the requested data is found. **Throughput** is another term which refers to the overall data transfer rate.

Encoding Method: The method by which data is transmitted to and recorded on the magnetic media of the drive. The three most popular encoding methods are: MFM (**Modified Frequency Modulation**), RLL (**Run Length Limited**), and ZBR (**Zone Bit Recording**). The encoding method indirectly determines many of the performance features of the hard drive.

Head: One of the tiny electronic read/write devices inside the hard drive which transmits data to and from the magnetic disk media. A drive typically has between four and 15 heads.

Interface: The connection between the hard drive and the computer. The four most common interfaces are: ST-506/412 (MFM and RLL), Enhanced Small Device Interface (ESDI), Integrated Drive Electronics (IDE), and Small Computer Systems Interface (SCSI).

Media Transfer Rate: This is the rate of transfer of data from one place to another, such as from computer main memory to disk. ST-506 and IDE type drives have a serial data path, which moves data one bit at a time from the drive to the controller.

Platter: One of the rotating metal disks (inside the drive) which is coated with a microscopic layer of magnetic material. A drive typically has between two and eight platters.

Rotational Speed: The rotational speed, or rate of platter rotation, determines how fast data is brought under the heads. Almost without exception, hard drive platters have a rotational speed of 3600 RPM.

Sector: A part of the track on a magnetic disk surface that is numbered and can hold a specified amount of data. For the most part, 512 bytes of data are stored on a single sector. Sectors are also called **blocks**. A cylinder can be divided into as few as 17 sectors (MFM), or as many as 64 sectors (ZBR).

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5.2 Drive Interfaces

There are four major types of hard drive interfaces prevalent in the personal computer industry:

      1) ST-506/412,
      2) ESDI (Enhanced Small Device Interface),
      3) IDE (Integrated Drive Electronics), and
      4) SCSI (Small Computer System Interface).

ST-506 was the first PC interface standard, developed in the early 1980s. The ST-412 followed and was later merged with the ST-506 standard. The ST-506/412 interface has two data recording systems associated with it: MFM (**Modified Frequency Modulation**) and RLL (**Run Length Limited**). These encoding methods relate to the patterns of electrical pulses that are translated into binary 0s and 1s.

ST-506/MFM Interface

The ST-506/MFM standard is the oldest type of hard drive and was the first used by IBM in personal computers.

Characteristics of MFM encoding

Interface:	ST-506
Encoding Method:	MFM
Media Density:	17 sectors/cylinder
Media Transfer Rate:	5.0 Mbits/sec
Overall Throughput:	375 KB/sec (approx.)

MFM drives interface with a computer system through a controller card. The **controller card** contains the electronics which translate requests for data from the system board BIOS into signals the hard drive can understand.

Both application and operating system software must operate through the BIOS to perform any disk operations. This is done via the Interrupt 13 BIOS call (see Appendix F for details).

During boot-up, the BIOS must know the specific characteristics of the hard drive, such as the number of heads and cylinders. The BIOS polls the CMOS RAM, where the drive information and other details of the system configuration are stored.

> **Note:** The Swan SETUP utility allows you to access and change the information in the CMOS RAM. See Chapter Eight for more information on the SETUP utility and the CMOS RAM.

The BIOS and CMOS RAM impose several constraints on an MFM hard drive. The IBM PC/AT BIOS does not support more than 16 heads, or more than 1024 cylinders. Also, the IBM BIOS only supports 17 sectors per cylinder (512 bytes per sector). Thus, the size of a single MFM hard drive cannot exceed 136 MB.

$$16 \text{ heads } x \ \frac{1024 \text{ cylinders}}{\text{head}} \ x \ \frac{17 \text{ sectors}}{\text{cylinder}} \ x \ \frac{512 \text{ bytes}}{\text{sector}} \ x \ \frac{1 \text{ MB}}{2^{20} \text{ bytes}} = 136 \text{ MB}$$

There are MFM hard drives with more than 1024 cylinders, but they require the use of special driver software to be recognized by the computer.

ST-506/RLL Interface

RLL encoding provides better performance than the ST-506/ MFM standard by compressing more information into a given area of the media. Where MFM has only 17 sectors per cylinder, RLL has 26 sectors. In one spin of an MFM-encoded platter, 8704 bytes of information (17 x 512) are brought past a head. In RLL encoding, 13,824 bytes are available in a single rotation of the platter.

Characteristics of RLL encoding

Interface:	ST-506
Encoding Method:	2,7 RLL
Media Density:	26 sectors/cylinder
Media Transfer Rate:	7.5 Mbits/sec
Overall Throughput:	650 KB/sec (approx.)

Like MFM drives, RLL drives interface with a computer system through a controller card which translates BIOS requests for data into signals the hard drive can understand. RLL drives, however, require an RLL controller card for proper operation. An RLL-certified drive behaves exactly like an MFM drive if connected to an MFM controller.

Since RLL drives have different physical characteristics than MFM drives, MFM BIOS routines cannot adequately manage an RLL drive. RLL controller cards have their own firmware, which intercepts Interrupt 13 requests (normally serviced by the system board BIOS) and executes the disk operation itself. The RLL firmware is activated by setting the CMOS SETUP information to Drive Type 1.

Enhanced Small Device Interface (ESDI)

ESDI is an enhanced ST-506-type disk drive interface which provides much higher performance than either MFM or RLL by allowing 34 sectors per track. ESDI was developed by Maxtor in 1983 and was an evolutionary step up from the ST-506 standard. Using cables of the same shape and size as ST-506, ESDI packs the most information into the least disk space. In most cases, ESDI drives use RLL encoding on the media, but this is "screened off" by the drive electronics; the ESDI controller card only sees an ESDI drive.

By moving certain signal operations from the controller to the hard drive itself, ESDI achieves 25-40 percent faster throughput. In fact, some ESDI manufacturers offer drive/controller combinations which can achieve a 15 or 20 MBit/sec media data transfer rate.

Characteristics of ESDI

Interface:	ESDI ST-506
Encoding Method:	1,7 RLL
Media Density:	34, 35, or 36 sect/cyl
Media Transfer Rate:	10.0 Mbits/sec
Overall Throughput:	800 KB/sec (approx.)

An ESDI drive requires an ESDI controller card which, like RLL, provides firmware to intercept and translate system board BIOS calls. The controller card ROM firmware is enabled whenever standard drive type 1 is selected in CMOS.

Some environments, like Novell, bypass BIOS calls and handle disk input/output themselves in order to enhance computer speed. Unfortunately, this may create a problem if the environment is designed to handle only 17 sectors/cycle hard drives (MFM) and ignore RLL and ESDI controller ROMs. An extended ROM is necessary to use an

interface other than MFM. This problem is eliminated by physically formatting the RLL or ESDI hard drive with the controller firmware using Adaptec's *17 sector translation* option. A special device driver supplied by the environment manufacturer may also be necessary to complete the task. Refer to the manufacturer's documentation for details.

Integrated Drive Electronics (IDE) Interface

In the Integrated Drive Electronics approach, most of the important electronics from the drive controller card are put directly on the hard drive itself. The remaining electronics can then be incorporated onto the main system board or a low-cost "paddle card," as it is in your Swan 486V. It is for this reason IDE is sometimes called**Imbedded AT**.

The resulting design completely eliminates the controller card from the computer system, and allows the IDE drive to connect directly to the main system board by a single 40-pin ribbon cable. This arrangement is inherently more reliable and more cost-effective than those in the ST-506 type drives. Also, since the controller card is essentially contained within the drive, there are no performance constraints imposed by the interface. One can find an IDE drive to fit just about any price or performance category.

Because the drive and controller electronics are in such close proximity, IDE drive manufacturers can implement additional features like RAM caches, automatic error checking, and automatic defect management, which can greatly enhance the performance and reliability of the drive system.

The physical configuration of an IDE hard drive is also free from limitations, which allows for a very flexible computer system. An IDE hard drive can be implemented with whatever number of heads, cylinders, and sectors/cylinder provide the best performance for a given hard drive capacity, even if the resulting physical configuration deviates widely from accepted standards.

For example, the Quantum LPS 52AT has the following physical configuration:

The Quantum LPS 52AT Physical Configuration

2 heads
1220 cylinders
49 sectors/cylinder (cylinders 0-453)
42 sectors/cylinder (cylinders 454-835)
35 sectors/cylinder (cylinders 836-1219)

The main system board BIOS of a PC compatible is only able to recognize drives with a uniform number of sectors/cylinder. As it stands, the physical configuration of this drive cannot be recognized by the BIOS. To resolve this, Quantum integrated electronics into the drive which translate the physical configuration into a **logical configuration**. The logical configuration is how the drive appears to the AT bus of the computer, and to BIOS.

The Quantum LPS 52AT Logical Configuration

8 heads
751 cylinders
17 sectors/cylinder

If a LPS 52AT were installed in a Swan 486V, the CMOS could be set up to indicate an 8-head, 751-cylinder, MFM hard drive. There is no pre-defined drive type of this description in the IBM AT drive type table, but this is not a problem. The BIOS of the Swan 486V has been enhanced to provide user-definable hard drive types, which can be modified to accept just about any configuration. Because of this enhancement, Swan is uniquely suited to take advantage of the IDE technology.

Refer to Chapter 8 of this manual for more information on the CMOS setup utility, and the installation of hard drives.

Because IDE is a fairly new technology, an industry-wide standard for the interface has not yet been developed. Therefore, you are strongly urged to purchase IDE drives from Swan Technologies. Swan IDE drives, and those of several other manufacturers, have been certified to operate correctly in the Swan 486V. There are, however manufacturers of IDE hard drives who have elected to use proprietary designs, and these drives simply will not operate correctly in your Swan 486V. If you are contemplating purchasing an IDE hard drive from a distributor other than Swan, please contact our Technical Services

Department for assistance, as they have an up-to-date listing of supported IDE hard drives. This list is also available on the Swan OnLine BBS.

Because IDE hard drive configurations, performance, and features can vary widely, even between different models of drives from the same manufacturer, Swan IDE hard drives are documented in a companion booklet, the "Swan IDE Hard Drive Installation Guide." This guide provides information to assist in the installation process of the drive, and also contains a listing its features and performance characteristics. Please refer to this document for additional details regarding your IDE hard drive.

Small Computer Systems Interface (SCSI)

Although SCSI interface development began in the 1970s, it wasn't until the Macintosh came out with a SCSI port in the mid-1980s that SCSI started to attract attention from the IBM-compatible industry.

SCSI drives are completely different than the ST-506 and IDE drives. With ST-506, the processor on the system board is actually positioning the heads, moving the data, checking for errors, etc. Since the CPU is responsible for these tasks, its attention is entirely consumed during disk activity. With SCSI drives, disk activity operates on a separate bus which is used to transfer instructions and data, leaving the processor free to handle other tasks. The SCSI bus is linked to the 486V system bus by an expansion card called a **host adapter**.

Each device on the SCSI bus can communicate directly with any other. Where ST-506 interfaces are limited to only two physical hard drives, a single SCSI host adapter can support up to seven SCSI devices, including optical disks, scanners, and hard drives. Each device (**target**) on the SCSI bus is essentially a self-contained computer. Thus, SCSI hard drives have their own built-in microprocessor (usually an Intel 8085 or Motorola 6800), RAM, ROM microcode, controller, etc. The host adapter also has its own processor, RAM, ROM, DMA controller, etc., as well as a firmware ROM.

The system board does not perceive the SCSI host adapter as a controller card: the correct CMOS SETUP configuration should indicate that no hard drives are installed, regardless of the number of SCSI drives. CMOS SETUP only cares about the number of ST-506-type drives connected to the controller card in the system board; an ST-506 controller card and drive can even be installed into the system along with the SCSI host adapter.

SCSI drives do not pass on information about the low-level

configuration to the host adapter. All information about heads, cylinders, and sectors is screened from the host adapter and from DOS. Although this information is necessary for the operation of the drive, it is not necessary for the retrieval of data. The SCSI system allows the on-device computer and controller to manage the functions of the drive.

The host adapter perceives the whole SCSI drive as one long continuous string of *logical blocks*. Each logical block is like a sector, 512 bytes in length, but the blocks are logically arranged as if all the sectors on the drive were located on a single straight piece of media.

The SCSI host adapter must, like RLL and ESDI, patch into BIOS to allow DOS to access the SCSI drives. Since DOS expects to deal with heads, cylinders, and sectors, the host adapter translates the arrangement of logical blocks into an artificial configuration of 64 heads, 32 sectors/cylinder, and some quantity of cylinders mathematically determined to use all of the drive space. An Imprimis 170 MB SCSI drive, for example, appears to DOS to have 64 heads, 169 cylinders, and 32 sectors per track. This arrangement increases the performance of DOS applications, but also causes drive benchmark programs to produce inaccurate numbers.

There is now an extension to the SCSI standard ratified by ANSI, called SCSI-2. SCSI-2 is a superset of the SCSI standard, and includes all of the previous functionality, with additional enhancements. For example, the data transfer rate of the SCSI bus has been increased to 10 megabytes per second. Also, the number of physical devices which can be connected to the SCSI bus has been increased from 8 to 64, and additional SCSI commands have been added to support removable hard drives, tape drives, optical drives, and high-end laser printers.

SCSI-2 is primarily implemented in SCSI-to-EISA host adapters in Extended Industry Standard Architecture (EISA) systems. These SCSI-to-EISA host adapters are needed to realize the incredible transfer rates possible with the SCSI-2 standard.

5.3 Preparing Your Hard Drive For Use

Three steps are required to prepare a hard drive for use: physical formatting, partitioning, and logical formatting.

Initialization

Initialization, or low-level formatting, lays out the sectors and tracks which constitute the basic organization of the hard drive

as recognized by the hard drive's controller card.

Swan Technologies initializes all hard drives before they are shipped. IDE and SCSI hard drives are hard-sectored--they do not need to be low-level formatted at all.

Partitioning

A hard drive partition is a large contiguous area of storage space on a hard drive allocated for use by an operating system. A hard drive can contain one partition, or may be divided into several partitions.

The hard drive must be partitioned before use. Under DOS, partitioning is performed with the DOS utility FDISK. For detailed information on FDISK see the *MS DOS User's Reference*. After the hard drive is partitioned, information which allows DOS to access data in the partition must be put on the disk. This process is called logical formatting, or DOS formatting, and should not be confused with low-level formatting.

You must perform this procedure prior to using your hard drive. Under MS-DOS, the utility to logically format a hard drive is FORMAT. For detailed information on FORMAT see the *MS DOS User's Reference*.

Note: The factory-installed hard drive on your 486V is already partitioned. If you install an additional hard drive, refer to chapter 8 of this manual for instructions.

Chapter Six: Video Systems

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6.1 Introduction

A video system is made up of two pieces of hardware: the **video card**, (also known as the **display adapter**), and the **monitor**.

Video systems offer a variety of **video modes**, or methods of operation. Video modes may be categorized by the following criteria: text vs. graphics, and color vs. black and white.

Text Mode

In **text mode** the monitor displays the PC family's basic character set, called the **Text Character Set**. The PC's screen is divided up into a grid of specific character positions called **character cells**, which are the smallest units on a text display screen; a matrix of pixels forms a single character cell. Character cells are usually 80 columns across the screen, and 25 lines of characters from top to bottom.

Graphics Mode

In graphics mode, the screen displays images made of arrays of tiny dots called **pixels** (short for _picture elements_). Pixels are the smallest units on a graphic display screen that can be stored, displayed, or addressed. The **resolution** of a screen display depends on how many pixels are on the screen; a high-resolution picture, which is produced by a large number of pixels, looks smooth and realistic.

Color

Color modes fall under the following categories:

1. _No color range_: Screen display consists of two colors (black and white).
2. _Color_: Can display between four and hundreds of different colors on the screen.

3. *Monochrome*: This mode has display attributes which simulate a variety of colors with shades of one color. A **display attribute** is a characteristic that displays normal screen elements differently. Graphics mode attributes include intensity and color/shade.

The capabilities of both your video card and your monitor determine what features a video system has in both text and graphics modes.

In order to make the best use of this section, you may want to familiarize yourself with the following terms.

Attributes - A characteristic quality of a screen element. Text mode attributes include bold face, underline, reverse image (dark characters on a light background instead of the other way around) and blinking. Graphics mode attributes include intensity and color.

Base Address - This is the location in your computer's memory where the beginning of a program is stored, or the window through which the software passes information to the video card.

Character Cell - The smallest units on a text display screen; made up of a matrix of pixels.

Palette - The set of colors (or shades of gray, if monochrome) available in a computer graphics system.

Resolution - Describes the clarity or fineness of detail attained by a monitor in producing an image. The resolution of a picture depends on the number of pixels on the screen. The more pixels per unit you have on the screen, the better the resolution will be.

Sync Rate - The frequency a monitor redraws (**scans**) the displayed image.

Video RAM - The amount of memory on the video card.

6.2 Video Card Types

Several different types of video cards are available for your Swan 486V. The video card plugs into an expansion slot on the computer's system board, making it possible to change display adapters according to need.

Monochrome

There are two basic types of monochrome video cards: the Monochrome Display Adapter (**MDA**) and the Hercules Graphics Card (**HGC**).

MDA generates 80-column by 25-row text, with well-defined characters. MDA does not display graphics.

The Hercules Graphics Card offers both text and high-resolution graphics modes.

HGC Specifics

Resolution:	720 x 348 pixels
Palette:	1
Attributes:	2
Text:	80 x 25
Character Cell:	9 x 14
Base Address:	B000:0 (page 0)
	B800:0 (page 1)
Video RAM:	64 KB
Sync Rate:	18.432 kHz

HGC resolution is higher than almost all other standard graphic systems except Video Graphics Array (VGA). A character displayed in HGC's 9 x 14 character cell is clear and well-defined.

The base address is not normally something the user needs to be concerned with to run software. HGC has two different pages of memory which programs may use.

Any monitor which scans at 18.432 kHz is compatible with HGC. This includes all digital monochrome monitors (known as **Transistor-**

to-Transistor-Logic or **TTL**), most EGA monitors, and all multi-scanning monitors. Monitors are reviewed in greater detail below.

While most software applications support HGC, the Hercules graphic standard is not simply color graphics without color; HGC is an entirely different method of displaying graphics. Software which requires color graphics (many games for example) will not run on an HGC system. If you wish to run color graphics software, HGC is simply not the choice of display standards.

VGA and Enhanced VGA

IBM's Video Graphics Array (**VGA**) offers modes downwardly compatible with CGA, EGA, and, in most cases, Hercules. Plus, it provides VGA modes with high-resolution and a vast palette. Though VGA was originally available only for IBM's PS/2 computers, video card manufacturers successfully created cards to port the higher resolution to standard PC-compatible computers.

Most VGA cards are actually enhanced VGA (**Super VGA** or **Extended VGA** or **VGA Plus**) cards, which support all of IBM's standard VGA modes and provide a few extra features. While enhanced VGA features vary from manufacturer to manufacturer, several very high resolution graphics modes have become common to many Super VGA cards:

800 x 600	16 colors/256 K (256 KB video RAM)
1024 x 768	16 colors/256 K (512 KB video RAM)
640 x 480	256 colors/256 K (512 KB video RAM)
800 x 600	256 colors/256 K (1 MB video RAM)
1024 x 768	256 colors/256 K (1 MB video RAM)

VGA Specifics

Mode	Resolution	Colors	Base
0,2	640 x 200	BW	B800
1,3	640 x 200	16	B800
4	320 x 200	4	B800
5,6	320 x 200	16	B800
D	320 x 200	16	A000
E	640 x 200	16	A000
F	640 x 350	BW	A000

10	640 x 350	16	A000
11	640 x 480	2	A000
12	640 x 480	16	A000
13	320 x 200	256	A000

Palette:	262144 (256 KB)
Attributes:	2/4/16/256
Text:	80 x 25
	80 x 30
	40 x 25
Character cell:	8 x 14
	8 x 16
	8 x 8
Base Address:	As shown above
Video RAM:	256 KB
Sync Rate:	31.469 kHz (Analog monitor)

All of the above modes are available on an EGA card except 11, 12, and 13. The major differences between EGA and VGA are the number of colors available at once, and the total available palette. These differences occur because the VGA card uses analog technology, not digital (TTL) technology.

Digital monitors display a limited number of colors. A CGA (digital) video card transmits its video signal along four wires which may be either "on" or "off." These four wires provide 16 (2^4) different combinations--the CGA palette. An EGA card uses six wires to transmit its digital signal and therefore has a palette of 64 (2^6) colors. A VGA (analog) video card transmits a varying range of electrical signals along each wire, producing a nearly infinite palette.

Most VGA card manufacturers offer enhanced features to distinguish their card from others. These Super VGA features vary from very high resolution extended modes (i.e. 1280 x 1240) to digital monitor support. Not all monitors are capable of very-high resolution--check your monitor's specifications for details.

The Swan Palette Plus Video Modes

The Swan Palette Plus VGA adapter is based on the Tseng Labs ET4000 video chip. The following chart shows the entire technical listing of the video modes available to owners of the Palette Plus card, and the corresponding synchronization frequencies. For a monitor to display a given video mode, it must have a bandwidth (BW) in excess of the mode's required video clock value, and support the mode's horizontal scan rate. The vertical scan rate, often called the refresh rate, of the monitor will logically follow from the stated VCLK and H scan frequencies.

Mode	Type	Colors/ Shades	Alpha Format	Buffer Start	Char Box	Max. Pag.	Display Size	Vid-Clk (MHZ)	H-Freq (KHz)	V-Freq (Hz)
0	A/N	16/256K	40x25	B8000	8x8	8	320x200	25.175	31.50	70.00
0*	A/N	16/256K	40x25	B8000	8x14	8	320x350	25.175	31.50	70.00
0+	A/N	16/256K	40x25	B8000	9x16	8	360x400	28.322	31.50	70.00
1	A/N	16/256K	40x25	B8000	8x8	8	320x200	25.175	31.50	70.00
1*	A/N	16/256K	40x25	B8000	8x14	8	320x350	25.175	31.50	70.00
1+	A/N	16/256K	40x25	B8000	9x16	8	360x400	28.322	31.50	70.00
2	A/N	16/256K	80x25	B8000	8x8	8	640x200	25.175	31.50	70.00
2*	A/N	16/256K	80x25	B8000	8x14	8	640x350	25.175	31.50	70.00
2+	A/N	16/256K	80x25	B8000	9x16	8	720x400	28.322	31.50	70.00
3	A/N	16/256K	80x25	B8000	8x8	8	640x200	25.175	31.50	70.00
3*	A/N	16/256K	80x25	B8000	8x14	8	640x350	25.175	31.50	70.00
3+	A/N	16/256K	80x25	B8000	9x16	8	720x400	28.322	31.50	70.00
4	APA	4/256K	40x25	B8000	8x8	1	320x200	25.175	31.50	70.00
5	APA	4/256K	40x25	B8000	8x8	1	320x200	25.175	31.50	70.00
6	APA	2/256K	80x25	B8000	8x8	1	640x200	25.175	31.50	70.00
7	A/N	Mono	80x25	B0000	9x14	8	720x350	28.322	31.50	70.00
7+	A/N	Mono	80x25	B0000	9x16	8	720x400	28.322	31.50	70.00
D	APA	16/256K	40x25	A0000	8x8	8	320x200	25.175	31.50	70.00
E	APA	16/256K	80x25	A0000	8x8	4	640x200	25.175	31.50	70.00
F	APA	Mono	80x25	A0000	8x14	2	640x350	25.175	31.50	70.00
10	APA	16/256K	80x25	A0000	8x14	2	640x350	25.175	31.50	70.00
11	APA	2/256K	80x30	A0000	8x16	1	640x480	25.175	31.50	60.00
11-72h	APA	2/256K	80x30	A0000	8x1	1	640x480	32.514	38.70	72.70
1	AP	16/256K	80x30	A0000	8x16	1	640x480	25.175	31.50	60.00
12-72h	APA	16/256K	80x30	A0000	8x16	1	640x480	32.514	38.70	72.70
13	APA	256/256K	40x25	A0000	8x8	1	320x200	25.175	31.50	70.00
21	A/N	16/256K	132x60	B8000	8x8	2	1056x480	40.000	30.50	60.00

Mode	Type	Colors/ Shades	Alpha Format	Buffer Start	Char Box	Max. Pag.	Display Size	Vid-Clk (MHZ)	H-Freq (KHz)	V-Freq (Hz)
22	A/N	16/256K	132x44	B8000	8x9	2	1056x396	40.000	30.50	70.00
23	A/N	16/256K	132x25	B8000	8x16	4	1056x400	40.000	30.50	70.00
24	A/N	16/256K	132x28	B8000	8x14	4	1056x392	40.000	30.50	70.00
25	APA	16/256K	80x60	A0000	8x8	1	640x480	25.175	31.50	60.00
25-72h	APA	16/256K	80x60	A0000	8x8	1	640x480	32.514	38.70	72.70
26	A/N	16/256K	80x60	B8000	9x8	2	720x480	28.322	31.50	60.00
29-35k	APA	16/256K	100x37	A0000	8x16	1	800x600	36.000	35.50	56.00
29-38k	APA	16/256K	100x37	A0000	8x16	1	800x600	40.000	38.00	60.00
29-48k	APA	16/256K	100x37	A0000	8x16	1	800x600	50.350	48.40	72.70
2A-35k	A/N	16/256K	100x40	B8000	8x15	4	800x600	36.000	35.50	56.00
2A-38k	A/N	16/256K	100x40	B8000	8x15	4	800x600	40.000	38.00	60.00
2A-48k	A/N	16/256K	100x40	B8000	8x15	4	800x600	50.350	48.40	72.70
**2D	APA	256/256	80x25	A0000	8x14	1	640x350	25.175	31.50	70.00
**2E	APA	256/256K	80x30	A0000	8x16	1	640x480	25.175	31.50	60.00
**2E-72h	APA	256/256K	80x30	A0000	8x16	1	640x480	32.514	38.70	72.70
**2F	APA	256/256K	80x25	A0000	8x16	1	640x400	25.175	31.50	70.00
**30-35k	APA	256/256K	100x37	A0000	8x16	1	800x600	36.000	35.50	56.00
**30-38k	APA	256/256K	100x37	A0000	8x16	1	800x600	40.000	38.00	60.00
**30-48k	APA	256/256K	100x37	A0000	8x16	1	800x600	50.350	48.40	72.70
**37i	APA	16/256K	128x48	A0000	8x16	1	1024x768	44.900	35.50	87.00
**37n	APA	16/256K	128x48	A0000	8x16	1	1024x768	65.000	49.00	60.50
**37-72m	APA	16/256K	128x48	A0000	8x16	1	1024x768	72.000	56.30	69.80
***38i	APA	256/256K	128x48	A0000	8x16	1	1024x768	44.900	35.50	87.00
***38n	APA	256/256K	128x48	A0000	8x16	1	1024x768	65.000	49.00	60.50
***38-72m	APA	256/256K	128x48	A0000	8x16	1	1024x768	72.000	56.30	69.80
***3Di	APA	16/256K	160x64	A0000	8x16	1	1280x1024	80.000	48.10	87.00

A/N = Alpha-numeric modes (text)

APA = All Points Addressable modes (graphics)

 * EGA text modes with 350 scan lines.

+ 9x16 character cell enhanced text modes with 400 scan lines.

 ** = modes require 512KB display memory.

*** = modes require 1MB display memory.

i = interlaced modes

n = noninterlaced modes

6.3 Monitors

Several different types of monitors are available for your 486V. In order to make the best use of this section, you may want to familiarize yourself with the following terms.

Scan Rate (or Scanning Frequency or Synchronization): Measures in kHz (kilohertz) the video card to monitor signal that lines up data properly on the screen. To display graphical images, a monitor must be able to handle the two synchronizing frequencies used to form them: the **horizontal scan rate** (the frequency at which one line is drawn across the width of the screen) and the **vertical scan rate**, also called the refresh or reframe rate (the frequency at which a complete screen is filled with image). Each graphic mode requires a different combination of these scan rates.

Bandwidth: Measures in MHz (megahertz) the speed at which the monitor is able to accept data from the video card.

Dot Pitch: Measures in millimeters the distance between the illuminated centers of any two adjacent pixels on the screen. A small dot pitch produces high resolution.

Digital Monochrome Monitors

These TTL monitors are typically used with a Hercules Graphics Card to display high resolution graphics and text. They may also be used with a Monochrome Display Adapter to display text. Monochrome monitors are fixed-frequency displays, which use long-persistence phosphors to hide the flicker effect by retaining their glow between image frames.

TTL Monochrome Specifics

Scan rate:	18.432 kHz Horiz., 50 Hz Vert.
Resolution:	720 x 350
Dot Pitch:	Not Applicable
Bandwidth (BW):	22 MHz

Colors:	1 (16 attributes)
Connectors:	Db-9F

Compatible with:	HGC, EEGA, digital VGA

HGC:	720 x 348 graphics
	80 x 25 text, 9 x 14 character cell

EEGA:	640 x 200 graphics, (16 shades)
	640 x 350 graphics, (16 shades)
	80 x 25 text, 8 x 14 character cell
	132 x 25 text, 8 x 8 character cell

Several manufacturers have developed EEGA cards which allow CGA and EGA software to run in shades of one color (**gray scale**) on a TTL monochrome monitor. Two such cards are the Paradise Autoswitch Monochrome Card and the ATI EGA Wonder Card.

Analog Monitors

Analog monitors achieve high resolution and a considerable color palette by transmitting an analog, rather than a digital, video signal. Analog monitors were developed to work with VGA video cards, and are not compatible with digital video cards.

All tube-type monitors are fundamentally analog devices capable of displaying an infinite number of colors (or shades) on the screen. Since your computer is a digital machine, a Digital-to-Analog Converter (DAC) chip on the video card is used to translate from digital to analog. Analog monitors offer a high level of performance at an affordable price--most of the electronics have been moved from the monitor to the VGA video card.

In a digital video system, the video card sends out digital signals which the monitor must convert to analog. Hence, digital monitors are tied to a precise digital display standard--a change in video card requires a change in monitor. In an analog video system, the VGA card can be replaced with a more advanced card that provides a greater variety of color using the same signal, and the same analog monitor may be used.

Color Analog Monitor Specifics

Scan rate:	31.469 kHz Horiz., 70 Hz Vert.
Resolution:	640 x 480
Dot Pitch:	.31 mm
Bandwidth (BW):	22 MHz
Colors:	Infinite
Connectors:	Db-15F
Compatible with:	VGA or Enhanced VGA only

VGA:	640 x 480 graphics, 16/256 K
	640 x 350 graphics, 16/256 K
	640 x 200 graphics, 16/256 K
	320 x 200 graphics, 256/256 K
	(720 x 348 graphics, 2 colors)
	80 x 30 text, 8 x 16 character cell
	(132 x 25 text, 8 x 8 character cell)

If a VGA card has 512 KB of video RAM:

640 x 480 graphics, 256/256 K

Monochrome Analog Monitor Specifics

Scan rate:	31.469 kHz Horiz., 70 Hz Vert.
Resolution:	640 x 480
Dot Pitch:	Not Applicable
Bandwidth (BW):	22 MHz
Colors:	64 shades of gray
Connectors:	Db-15F

VGA:	640 x 480 graphics, 16/256 K
	640 x 350 graphics, 16/256 K
	640 x 200 graphics, 16/256 K
	320 x 200 graphics, 256/256 K
	(720 x 348 graphics, 2 shades)
	80 x 30 text, 8 x 16 character cell
	(132 x 25 text, 8 x 8 character cell)

If a VGA card has 512 KB of video RAM:

640 x 480 graphics, 256/256 K

Chapter 7: Technical Information

At the heart of your Swan 486V is the Intel i486SX-25 or i486-33 chip, one of the most advanced integrated circuits in existence, with over one million transistors contained in a one and three-quarters inch square ceramic package. The i486 processor is a superset of the i386 processor, containing all of its features, plus performance enhancements, while preserving 100% code compatibility. Technical details of the i486 processor and the memory system are discussed in this chapter.

7.1 Architectural Overview of the i486 Processor

The 486 microprocessor is a 32-bit architecture with on-chip memory management, floating point, and cache memory units.

The 486 microprocessor contains all of the features of the 386 microprocessor with enhancements to increase performance. The instruction set includes the complete 386 microprocessor instruction set along with extensions to serve new applications. The on-chip memory management unit (MMU) is completely compatible with the 386 microprocessor MMU. The 486DX microprocessor brings the 387 math coprocessor on-chip. (486SX does not contain math.) All software written for the 386 microprocessor, the 387 math coprocessor, and previous members of the 86/87 architecture family, will run on the 486 microprocessor without any modifications.

Several enhancements have been added to the 486 microprocessor to increase performance. On-chip cache memory allows frequently used data and code to be stored on-chip, reducing accesses to the external bus. RISC design techniques have been used to reduce instruction cycle times. A burst bus feature enables fast cache fills. All of these features combined lead to performance greater than twice that of a 386 microprocessor at the same clock speed.

The **memory management unit** (MMU) consists of a **segmentation unit** and a **paging unit**.

Segmentation allows management of the logical address space by providing easy data and code relocatibility and efficient sharing of global resources.

The paging mechanism operates beneath segmentation and is transparent to the segmentation process. Paging is optional and can be divided into one or more 4 Kbyte segments. To implement a virtual memory system, the 486 microprocessor supports full restartability for all page and segment faults.

Memory is organized into one or more variable length **segments**, each up to four gigabytes (2^{32} bytes) in size. A segment can have attributes associated with it which include its location, size, type (i.e., stack, code, or data), and protection characteristics. Each task on a 486 microprocessor can have a maximum of 16,381 segments, each up to four gigabytes in size. Thus each task has a maximum of 64 terabytes (trillion bytes) of virtual memory.

The segmentation unit provides four levels of protection for isolating and protecting applications and the operating system from each other. The hardware enforced protection allows the design of systems with a high degree of integrity.

The 486 microprocessor has two modes of operation: **Real Address Mode** (Real Mode) and **Protected Mode Virtual Address Mode** (Protected Mode).

In Real Mode the 486 microprocessor operates as a very fast 8086. Real Mode is required primarily to set up the processor for Protected Mode operation.

Protected Mode provides access to the sophisticated memory management paging and privilege capabilities of the processor. Within Protected Mode, software can perform a task switch to enter into tasks designated as Virtual 8086 Mode tasks. Each virtual 8086 task behaves with 8086 semantics, allowing 8086 software (an application program of an entire operating system) to execute.

7.2 The On-Chip Main Memory Cache of the i486 Processor

The on-chip **Main Memory Cache** is 8 Kbytes in size. It is four-way set-associative and follows a write-through policy. The on-chip cache includes features to provide flexibility in external memory system design, and directly supports an external, secondary cache. Individual memory pages can be designated as cacheable or non-cacheable by software or hardware.

The on-chip cache has been designed for maximum flexibility and performance. The cache has several operating modes offering flexibility during program execution. Protocols for cache line invalidations and replacement are implemented in hardware, easing system design.

The on-chip cache is a unified code and data cache. The cache is used for both instruction and data accesses and acts on physical addresses.

The cache organization is four-way set-associative and each line

is 16 bytes wide. The eight Kbytes of cache memory are logically organized as 128 sets, each containing four lines.

The cache memory is physically split into four 2 Kbyte blocks, each containing 128 lines. Associated with each 2 Kbyte block are 128 21-bit tags. There is a valid bit for each line in the cache. Each line in the cache is either valid or not valid. There are no provisions for partially valid lines.

The write strategy of on-chip cache is write-through. All writes will drive an external write bus cycle in addition to writing the information to the internal cache if the write was a cache hit. A write to an address not contained in the internal cache will only be written to external memory. Cache allocations are not made on write misses.

7.3 Main Memory Configuration
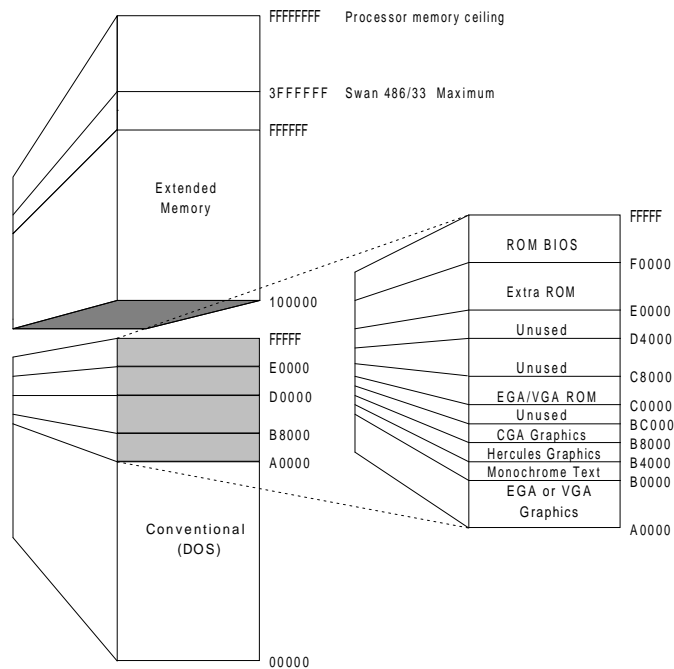
Figure 7.1 Memory Map

7.4 Expanded (EMS) Memory Overview

The Intel 8088 microprocessor used in the original IBM PC has a maximum memory size (address space) of 1 MB, the upper 384 KB of which is reserved for system use (i.e. video memory, ROM BIOS, etc.). Only 640 KB of the 8088's address space is available for user applications. Since MS-DOS and DOS applications were designed for the IBM/PC, they were locked into this conventional memory size restriction at an early stage.

Expanded memory was developed to work around the DOS 640 KB barrier. Using a technique called block switching, an Expanded Memory Manager (software) takes memory on a memory expansion card and divides it into small, fixed-sized pages (blocks), which can be switched into conventional memory one at a time.

Since an expanded memory manager is software, many different ways of addressing expanded memory exist. To standardize the industry, three of the largest companies related to microcomputers--Lotus, Intel, and Microsoft, (LIM)--convened to develop an Expanded Memory Specification (EMS) which contains all of the necessary features in one single, neat package: LIM EMS 4.0. Just about every software package which uses expanded memory complies with LIM EMS 4.0.

Three other major companies--AST, Quadram, and Ashton-Tate--developed a superset of LIM EMS 4.0 with enhanced features. This EEMS specification includes all of the features of LIM EMS, with somewhat enhanced performance.

7.5 Extended Memory

With the introduction of the 80286, and later the 386 and 486, the 1 MB address limitation became a thing of the past (see Figure 7.1).

Unlike EMS memory, Extended memory does not have a fixed block size for the allocation and de-allocation of memory. Extended memory is allocated in segments which can be varied in size to exactly fit the application's need.

To take advantage of the 486V's extended memory, you must have an operating environment (such as Windows 3.x, XENIX, or OS/2) and accompanying software designed to support extended memory. Since the original 8088 personal computer and its operating

system, MS-DOS, were not developed with extended memory in mind, these features remain generally untapped.

There are, however, Shell environments for MS-DOS (programs which "wrap themselves around" the operating system to provide extra features) which manage extended memory, typically converting extended memory to EMS. An example of this is DesqView. Also, MS-DOS provides an installable device driver called RAMDRIVE.SYS, which allows you to configure extended memory as a RAM disk. A RAM disk behaves as a high-speed disk drive, which loses its contents when power to the computer is turned off. See your DOS manual for details.

Chapter Eight: Upgrading The Swan EISA DB Systems

If you have little or no experience with hardware installation, we recommend that you obtain technical assistance from the manufacturer of the product you wish to install, or from Swan's technical staff.

If you have experience with upgrading personal computers, you can make best use of this chapter by reviewing the Swan-specific guidelines provided here before referring to the documentation which accompanies the hardware you purchased.

8.1 The Setup Utility

A record of your Swan system configuration is stored in a special memory chip called **CMOS** (Complementary Metallic Oxide Semiconductor). CMOS memory is powered by a battery pack which is separate from your main power supply. The information in CMOS memory, including the date, time, number of floppy drives, number and type of hard drives, etc., is not lost when you turn off your computer. The configuration information for your Swan system was entered into CMOS memory in the factory, so you won't be required to change it when you receive your computer.

To store or edit the configuration information, you must run the Setup utility. Setup is programmed into ROM, and may be executed by pressing <Del> during POST.

If you change the configuration of your computer, you must update the CMOS information to reflect the change, or new devices may not be recognized by the computer.

The following is a listing of the keys you can use throughout the BIOS Setup program:

ESC   Exit to previous screen.

ARROW KEYS   Use to move cursor to desired selection.

PAGEUP/PAGEDOWN/CTRL-PAGEUP/CTRL-PAGEDOWN
                          Modify the default value of the options for the highlighted feature.

F1   Displays the help screen for selected feature.

F2/F3   Changes background and foreground colors.

F5   Retrieves the values which were resident when current
                setup session was started. These values will be CMOS
                values if the CMOS was uncorrupted at the start of the
                session, or they will be the BIOS Setup default values.

F6   Loads all features in the Advanced CMOS Setup/
                Advanced ChipSet Setup with the BIOS Setup defaults.

F7   Loads all features in the Advanced CMOS Setup/
                Advanced ChipSet Setup with Power-On defaults.

F10   Saves all changes made to Setup and exits program.

> Note: The default value for the prompts which occur when the
>   <F5>, <F6>, and <F7> keys are pressed is always <N>
>   (No). Actually executing these options requires changing
>   the <N> to <Y> (Yes) and pressing <ENTER>.

```
       BIOS SETUP PROGRAM - AMI BIOS SETUP UTILITIES
   (c) 1990 American Megatrends Inc., All Rights Reserved


                  STANDARD CMOS SETUP
                  ADVANCED CMOS SETUP
                 ADVANCED CHIPSET SETUP
           AUTO CONFIGURATION WITH BIOS DEFAULTS
        AUTO CONFIGURATION WITH POWER-ON DEFAULTS
                   CHANGE PASSWORD
                  HARD DISK UTILITY
                WRITE TO CMOS AND EXIT
              DO NOT WRITE TO CMOS AND EXIT


  StandardCMOSSetupforChangingTime,Date,HardDiskType,etc.
        ESC:EXIT     :Sel F2/F3:CoLor F10:Save&Exit
```

Each of the options in the main menu will be detailed in the
following sections.

8.1.1 Standard CMOS Setup

To check or modify the general system configuration, choose "STANDARD CMOS SETUP" from the Setup main menu and press <Enter>. The screen will display the following or a similar message:

```
                 BIOS SETUP PROGRAM - STANDARD CMOS SETUP
           (C) 1990,American Megatrends Inc.,All Rights Reserved

Date (mn/date/year)    :Tues, Jan 01 1991    Base memory size :640 KB
Time (hour/min/sec)    :04:07:29             Ext. memory size :3072 KB
Daylight saving        :Disabled       Cyl Head Wpcom LZone Sec Size
Hard disk C:type       :47=USER TYPE   1314 7    1314 1314  17  76 MB
Hard disk D:type       :Not installed
Floppy drive A:        :1.2 MB,5 1/4"
Floppy drive B:        :1.44 MB, 3 1/2"  Sun Mon Tue Wed Thu Fri Sat
Primary display        :VGA/PGA/EGA      31   1   2   3   4   5   6
Keyboard               :Installed         7   8   9  10  11  12  13
                                         14  15  16  17  18  19  20
                                         21  22  23  24  25  26  27
                                         28  29  30   1   2   3   4
                                          5   6   7   8   9  10  11

ESC:Exit    :SelectF2/F3 :Color PU/PD   :Modify
```

On-screen instructions in the lower left corner of the screen explain how to use the program. After making all selections, press the <ESC> key and return to the main menu to choose another Setup program. Following are explanations of the items in the Setup menu.

Date:
In the Date field, you can manually set the electronic calendar on the system board, but you only need to if the values are incorrect.

Time:
Time fields include the hour, minutes, and seconds, but you can only set the value of the hour and minute. Check these fields and adjust them if necessary.

Daylight Savings:
In this field, you can enable or disable the daylight savings function.

Floppy Drive A and B:
Here you should specify the capacity and format of the floppy

drive(s) installed in your system as follows:
- 360 KB, 5 1/4"
- 1.2 MB, 5 1/4"
- 720 KB, 3 1/2"
- 1.44 MB, 3 1/2"
- Not Installed.

Hard Disk C: and Hard Disk D:

In these fields, you specify the physical and electronic properties of the "Standard" hard disk drives installed on your system. Relevant specifications include the number of cylinders and heads, write precompensation time, read/write head landing zone, and number of sectors per track.

The BIOS provides 46 predefined types of popular hard disk drives. You select the appropriate type by scrolling forward/backward using the <PgUp> and <PgDn> keys. The relevant specifications of the selected drive will be displayed immediately on the corresponding field positions as you scroll.

If your particular drive is not one of the 46 predefined types, simply scroll down and select type 47, then use the left and right arrow keys to move to the Cyln (Cylinders), Head, Wpcom (Write precompensation), LZone (Landing Zone), and Sec (Sectors) fields and directly key in the appropriate values. Refer to your hard drive documentation for this information. The Setup program will calculate the capacity of the drive based on the input cylinder, head, and sector numbers and display the result on the capacity field for your reference.

Primary Display:

In this display field you should specify the display adapter installed in your system.

Keyboard:

This setting is used to select "Installed" or "Not Installed" for the keyboard during the Power On Self Test (POST). Normally it should be set as "Installed."

Base Memory:

A small section in the upper right corner of the screen displays information about the amount of base and extended memory. These figures are updated automatically by the Setup program, so no manual changes should be made.

8.1.2 Advanced CMOS Setup

When you choose the "RUN Advanced CMOS Setup" option in the Setup menu, the screen displays the following menu, which should have these or similar settings. This menu lists the default settings.

```
                 BIOS SETUP PROGRAM - ADVANCED CMOS SETUP
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Typematic Rate Programming   :Disabled   Video ROM Shadow C000,16K   :Enabled
Typematic Rate Delay (msec)  :500        Video ROM Shadow C400,16K   :Enabled
Typematic Rate (Char/sec)    :15         Adapter ROM Shadow C800,16K :Disabled
Above 1 MB Memory Test       :Enabled    Adapter ROM Shadow CC00,16K :Disabled
Memory Test Tick Sound       :Enabled    Adapter ROM Shadow D000,16K :Disabled
Memory Parity Error Check    :Enabled    Adapter ROM Shadow D400,16K :Disabled
Hit <DEL> Message Display    :Enabled    Adapter ROM Shadow D800,16K :Disabled
Hard Disk Type 47 RAM Area   :0:300      Adapter ROM Shadow DC00,16K :Disabled
Wait for <F1> if any Error   :Enabled    Adapter ROM Shadow E000,64K :Disabled
System Boot Up Num Lock      :On         System ROM Shadow F000,64K  :Enabled
Floppy Drive Seek At Boot    :Enabled    Boot Sector Virus Protection:Enabled
System Boot Up Sequence      :A:, C:     Cacheable ROM Area          :Main
System Boot Up CPU Speed     :High
External Cache Memory        :Enabled
Internal Cache Memory        :Enabled
Fast Gate A20 Option         :Enabled
Turbo Switch Function        :Enabled
Password Checking Option     :Setup

         ESC:Exit    :Sel(Ctrl)Pu/Pd:Modify F1:Help F2/F3:Color
       F5:Old Values F6:BIOS Setup Defaults F7:Power-On Defaults
```

Note: You can obtain help information by highlighting any field and pressing <F1>; use the arrow keys to highlight the selected field.

A description of each item in this menu follows.

Typematic Rate Programming:
By enabling this option, the user can adjust the rate at which a keystroke is repeated. If you enable this, use the next two options--Typematic Rate Delay and Typematic Rate--to set the values you want. When a key is pressed and held down, the character appears on the screen and after a delay set by the delay option, it keeps on repeating at the rate set by the rate option.

Above 1 MB Memory Test:
This feature, when enabled, will invoke the POST memory routines on the RAM above 1 MB. If disabled, the BIOS will only check the first 1 MB of RAM.

Memory Test Click Sound:

This options enables or disables the ticking sound heard during the memory test.

Memory Parity Error Check:

If the system board does not have parity RAM, the user may disable the memory parity error checking routines in the BIOS.

Hit <DEL> Message Display:

Disabling this option will prevent the message "Hit <DEL> if you want to run SETUP" from appearing on the screen when the system boots up.

Hard Disk Type 47 RAM Area:

The purpose of this field is to specify the address of the memory area used by the system BIOS for storing extended information, such as the user definable drive type 47. There are two options, to provide compatibility with operating systems like Novell NetWare 286.

- 0:300
  To reserve the stack area at address 30h:0.

- DOS 1 KB
  To reserve the top 640 KB in the DOS base memory, and reduce the size of base memory by 1 KB.

The default is option "0:300."

Wait For F1 If Any Error:

If any of the BIOS routines fails during boot up and it is a non-fatal error, the BIOS will display "Press <F1> to continue." If this option is disabled, any non-fatal error which occurs will not generate this message. A list of BIOS error messages is found in Appendix I.

System Boot Up Num Lock:

This option allows you to set the Num Lock key to default to either on or off after system boot up.

Floppy Drive Seek At Boot:

If this option is set to "disabled" it allows a fast boot and decreases the possibility of damage to the heads.

System Boot Up Sequence:

The BIOS will normally attempt to boot from floppy drive A: (if present), and if unsuccessful, will attempt to boot from hard drive C:. Switching this setting to C:, A: means it will try to boot from C: first. The default for this setting is A:, C:, in order to protect data in the event of a hard drive failure.

System Boot Up CPU Speed:

The speed at which the system will boot up is determined with this option. The default is high (normal) speed.

External Cache Memory:

Use this field to enable or disable the external cache. The default is "enabled" because the cache increases system performance.

Internal Cache Memory:

Use this field to enable or disable the internal cache of the 486 CPU. The default is "enabled" because the cache increases system performance.

Turbo Switch Function:

Use this field to enable or disable the turbo switch function if your computer chassis has a turbo switch. The default is "enabled."

Password Checking Option:

The purpose of this field is to determine whether the password is asked for every time the system is booted. Set to "Always" if you wish to enable the password function, or to "Disabled" if you don't want to use a password. If you wish to use a password only for access to the CMOS Setup program, set to "Setup."

ROM Shadow Fields:

The fields on the right side of the screen are for shadowing various addresses for video ROM, system ROM, or adapters. The two video fields and the system field should be enabled to enhance performance. The default for all of the adapter settings is "disabled" if you have no adapters in your system.

Cacheable ROM Area:

Options are Disabled, Video, Main, and Both. The default is Main. Caching the video ROM sometimes interferes with certain applications. Caching the main ROM improves overall system performance.

8.1.3 Advanced CHIPSet Setup

This menu takes the place of additional system board jumpers. It is for factory use only. A brief explanation and the default for each item is listed after the menu. The screen will display the following menu. The values shown are the default settings.

```
              BIOS SETUP PROGRAM  - ADVANCED CHIPSET SETUP
         (C) 1990 American Megatrends Inc., All Rights Reserved

 Hidden Refresh                :Hidden
 Non-Cache Size Block-0        :Disabled
 Non-Cache Start Block-0       :000000
 Non-Cache Size Block-1        :Disabled
 Non-Cache Start Block-1       :000000
 Non-Cache Size Block-2        :Disabled
 Non-Cache Start Block-2       :000000
 Cache Early Write Enable      :Disabled
 Cacheable Region              :64 MB
 BCLK Stretch                  :Disabled
 Fast Keyboard Reset           :Fast



       ESC:Exit   :Sel(Ctrl)Pu/Pd:Modify F1:Help F2/F3:Color
      F5:Old Values F6:BIOS Setup Defaults F7:Power-On Defaults
```

Hidden Refresh:
This field has two choices, Hidden and AT Style. This option should be set to "Hidden" if the system uses fast page mode DRAM. Your Swan system does, so Hidden is the default.

Non-Cacheable Block-0 Size:
This setting is used to assign a non-cacheable block of memory if you have a certain expansion product that may require a protected address space in memory. This field sets the size of the block and the next field sets the address of the area to remain uncacheable. Choices are 64 KB, 128 KB, 256 KB, 512 KB, and Disabled. You can set up to three different blocks, using the 0, 1, and 2 fields.

Non-Cacheable Block-0 Start:
This setting is used to set the base address of the block size if you enabled the previous field.

Non-Cacheable Block-1 Size:

This setting is used to assign a second non-cacheable block of memory if you have a certain expansion product that may require a protected address space in memory. This field sets the size of the block and the next field sets the address of the area to remain uncacheable. Choices are 64 KB, 128 KB, 256 KB, 512 KB, and Disabled.

Non-Cacheable Block-1 Start:

This setting is used to set the base address of the block-1 size if you enabled the previous field.

Non-Cacheable Block-2 Size:

This setting is used to assign a third non-cacheable block of memory if you have a certain expansion product that may require a protected address space in memory. This field sets the size of the block and the next field sets the address of the area to remain uncacheable. Choices are 64 KB, 128 KB, 256 KB, 512 KB, and Disabled.

Non-Cacheable Block-2 Start:

This setting is used to set the base address of the block-2 size if you enabled the previous field.

Cache Early Write Enable:

This field can be set to enabled or disabled. The default is disabled, because enabling can sometimes cause interference with system operation. If enabled, set the next field to the cache amount you wish to enable.

Cacheable Region:

This field is used to set the cache amount for early write if you enabled the previous field.

BCLK Stretch:

This can be set to disabled or enabled. The default for this setting is "disabled," since enabling can cause interference with certain I/O cards in some cases.

Fast Keyboard Reset:

This field is set to fast or slow. The "Slow" option means the system will wait for a halt after a keyboard reset command. Fast will generate a keyboard reset immediately. "Fast" is the default setting.

8.1.4 Auto Configuration With BIOS Defaults

This feature uses the default system values before the user has changed any CMOS values. If the CMOS is corrupted, the BIOS defaults will automatically be loaded.

If you wish to use the BIOS defaults, change the prompt to <Y> and press <ENTER>. The message "Default values loaded. Press any key to continue." will appear.

8.1.5 Auto Configuration With Power-On Defaults

This feature uses the default Power-On values. You may wish to use this option as a diagnostic aid if your system is behaving erratically.

If you wish to use the Power-On defaults, change the prompt to <Y> and press <ENTER>. The message "Default values loaded. Press any key to continue." will appear.

8.1.6 Using the Change Password Setup

The BIOS Setup has an optional password feature. The system may be configured by the user so that a password must be entered every time the system boots or to enter Setup. Or it may be disabled so that a password prompt will never appear. Refer to the Password Checking Option in section 8.1.2.

To change the password, choose the "CHANGE PASSWORD" option from the Setup main menu and press <Enter>.

If the CMOS is bad (due to a low or dead battery) or this option has never been used, there is a default password which is stored in the ROM. The screen will display a message asking you to enter the ROM Password. The default password is <AMI>.

If the CMOS is good or this option has been used to change the default password, the user is asked for the password stored in the CMOS. The screen will display a message asking you to enter the current password. Enter the correct password and continue.

After entering the ROM password or the current user-defined password, you can change the password stored in CMOS. The word can be up to six letters in length. You will get the following prompts:

```
Enter NEW Password:

Re-Enter NEW Password:
NEW Password Installed:
```

```
Press <Enter> and return to the main menu.
```

Warning: DO NOT FORGET YOUR PASSWORD! If you define a password, and set the Advanced CMOS setup option to "Always," there will be no way to boot the computer without entering the proper password.

If you do forget your password, you must open the computer chassis, and disconnect the battery backup from the system board. After waiting about five minutes, re-connect the battery and re-boot the computer. The entire contents of CMOS will now be invalid, requiring you to run SETUP and re-enter all of the configuration data.

8.1.7 Hard Disk Utility

Warning: Performing the Hard Disk Format, Auto Interleave, and/or Media Analysis will destroy any data on the hard disk being tested. Back up the hard disk(s) <u>before</u> performing any of these routines.

Note: These routines are not valid for a SCSI disk drive.

The Hard Disk Format option performs a "low level" format of the hard drive(s). The Auto Interleave option determines the optimum interleave factor prior to the format of the hard drive(s). The Media Analysis option performs an analysis of each track of the hard drive to determine whether it is usable. If it isn't, the track is marked as "bad" so that data won't be stored there.

Warning: These are features that are part of your Setup program. We recommend that you DO NOT run these options on the hard drive that came in your computer. Your drive has already been formatted, the software has been loaded, and the system has been preconfigured. Running any of these options would wipe out all the formatting and software. You may want to use these features if you purchase and install a brand new hard drive that did not come with your computer.

If you are installing a brand new hard rive, it may come with the manufacturer documentation that includes a list of bad tracks. It might also include the optimum interleave factor. If you have both of these, you won't have to run the auto interleave or media analysis options. Just run the hard disk format option. If you are installing a used hard disk or reformatting an existing hard disk, perform the media analysis and then the auto interleave. Again, we recommend that you don't use these utilities on the drive that came in your computer. If you run them on any drive, make sure you have backed up all data and application programs that you will need, since all material on the drive will be lost.

Hard Disk Format Utility

Warning: Using this option will destroy all data on the hard disk. Back up any data/programs before running. This routine is not valid for an IDE or SCSI disk.

This utility may be used to integrate a new hard drive to the system, or to reformat a used drive which has developed some bad patches as a result of aging or poor handling. To run the utility, press <ENTER> at the option on the menu.

A box will appear containing a series of prompts which must be answered before performing the hard disk format program. The first question asks for which drive (C or D). The second asks for the drive type. These two may already be there, if the information is in Standard CMOS Setup.

The third item in the box on the format screen is interleave. This can be selected manually or determined using the auto interleave feature.

The fourth line is "mark bad tracks." The manufacturer of the hard drive usually provides a list of bad tracks with the hard drive. These tracks should be entered using this option and they will be marked as bad to prevent data from being stored on them. When you put a <Y> next to the line and press <ENTER> you get a window with four options: add an entry, revise an entry, delete and entry, and clear bad track list.

The last line of the hard disk format feature is the proceed prompt. When the proceed prompt is changed to <Y> and <ENTER> is pressed, a warning screen will be displayed telling you that all data will be lost if you proceed. If you change the prompt to <Y> and press <ENTER> all data will be irrevocably lost.

Auto Interleave Utility

> **Warning**: Using this option will destroy all data on the hard disk. Back up any data/programs before running. This routine is not valid for an IDE or SCSI disk.

The autoleave utility calculates the optimum interleave value through trial and error by measuring the transfer rate for four different interleave values. To determine the best interleave factor, the system will format a portion of the hard disk for each transfer rate calculated. The cylinders, heads, and sectors formatted for each value will be displayed in the activity box on the screen.

To begin the process, use the arrow keys to select it on the main hard disk utility menu screen and press <ENTER>. A box will appear with four line items: disk drive (C or D), drive type, mark bad tracks, and proceed. The cursor will automatically go to the third line. The default is no (<N>). To mark additional bad tracks change it to yes. If you make any change to the bad tracks box, press <ESC> to return to the proceed line of the interleave screen. To proceed, change to <Y> and press <ENTER>. You will get a warning telling you that proceeding will wipe out the contents of the hard drive. If you don't want to proceed, you can just press <ENTER> and you'll be returned to the main hard disk utility menu.

Media Analysis Utility

> **Warning**: Using this option will destroy all data on the hard disk. Back up any data/programs before running. This routine is not valid for an IDE or SCSI disk.

This utility performs a series of tests to locate bad or damaged patches on the hard disk as a result of aging or poor handling. It locates all bad tracks on the hard disk and lists them in the Bad Track List Box. Since this test writes to all cylinders and heads on the disk to verify any bad tracks, the test may require several minutes to complete. For best results, run this test in its entirety.

To run the utility, use your arrow keys to select it in the main hard drive option menu and press <ENTER>. A screen will appear with these three lines: disk drive (C or D), drive type, and proceed. The cursor will appear at the proceed prompt. If you press <ENTER> a warning screen will appear telling you that if you proceed all data will be lost irrevocably. If you don't want to proceed, just press <ENTER> and you'll

be returned to the main menu. If you want to proceed, change the prompt to <Y> and press <ENTER>.

8.1.8 Write to CMOS and Exit

The features selected and configured in the Standard Setup, Advanced CMOS Setup, Advanced Chipset Setup, and the New Password Setup will be stored in the CMOS when this option is chosen from the main BIOS menu. The CMOS checksum is calculated and written to the CMOS. Control is then passed back to BIOS.

You will get a prompt asking you "Write to CMOS and exit (Y/N)?" Pressing <N> and <ENTER> will let you remain in the main menu. If you press <Y> and <ENTER> it will save the system parameters and continue with the booting process.

8.1.9 Do Not Write to CMOS and Exit

This option passes control back to the BIOS without writing any changes to the CMOS. You will get the prompt "Want to quit without saving?" Pressing <N> and <ENTER> will let you remain in the main menu. Pressing <Y> and <ENTER> will continue with the booting process without saving any system parameters.

8.2 Preparing To Upgrade Your Computer

Backup Warning: Before you perform any upgrading, be sure to back-up your hard drive. Swan is not liable for any loss of data during an upgrade attempt.

Warning: All components within the computer chassis are very sensitive to ESD (Electrostatic Discharge). Component damage may be invisible at first, but the life of the part can be shortened. Precautions to take while handling components include using a wrist strap (available at stores like Radio Shack) and frequently touching a grounded metal object like a metal desk, radiator, or the computer chassis itself.

Before you install a new component, be sure to turn off the computer's power. Remove the AC power cord from the rear of the chassis. Disconnect all cables, such as keyboard and printer cables. We recommend that you use the guidelines provided here in conjunction with the item manufacturer's installation guide.
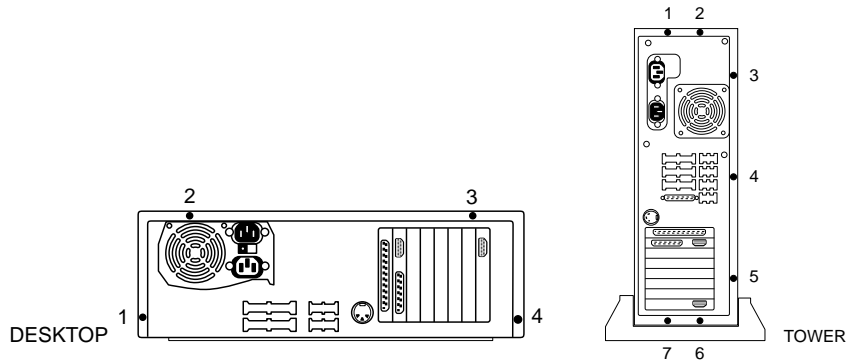
Figure 8.1 Removing the Case Cover

The standard EISA DB System comes in the baby AT desktop case. Follow these steps to open the case.

Baby AT Desktop Model:

1. Turn off the power and remove all cables.

2. Set the chassis on a flat surface.

3. Remove the four screws along the back edge of the case with either a #2 Phillips or 1/4" nut driver. See Figure 8.1.

5. Slide the computer case one-half inch backward.

6. Lift the chassis cover straight up. The front bezel remains on the chassis.

Tower Model:

1. Lay the computer down on its left side, as viewed from the rear.

2. Follow the same steps as outlined above for the desktop model, but there will be seven screws, instead of four.

> Important: After you have finished upgrading your computer, you must close the case by reversing the above steps. Slide the case back on, making sure it fits tightly in place. Replace the four screws.

8.3 Installing An IDE Hard Drive

This section outlines the procedures for installing and initializing Integrated Drive Electronics (IDE) drives. We assume that you already have the proper IDE host adapter installed in your computer.

Installing The Hard Drive

1. Remove the chassis cover, as outlined on page 8-15.

2. Configure the hardware jumpers on the drive. Refer to the drive documentation for specifics. If you intend to add a drive to a computer which already has one drive installed as drive C, make sure the drives are properly configured as master and slave. Master/slave compatibility should always be verified before purchasing a second IDE hard drive. Refer to the drive's documentation for master/slave jumper settings, as drives of different types and from different manufacturers will have different jumper settings and compatibility configurations.

3. There are two standard 3 1/2" hard drive brackets inside the chassis--underneath and on the side of the power supply. Remove the hard drive support bracket by pushing the latch spring in, and pulling the bracket out.

4. Slide the drive inside the bracket with the components facing outward. Secure the drive by lining up the holes on the drive and bracket, and putting two screws on each side.

5. Re-attach the whole unit inside the chassis by sliding the support bracket back in till the latch spring snaps in place.

6. Connect the IDE interface cable to the 40-pin male connector on the back of the drive. The ribbon cable should be installed so the colored wire (pin 1 indicator) is closest to the power supply connector. Connect the other end of the ribbon cable to the 40-pin male connector on the IDE paddle board, being careful to insure that pin 1 on the paddle board (labeled on the card) lines up with pin 1 on the ribbon cable (colored wire).

7. Connect one of the available power connectors from the power supply to the back of the drive. The four-wire connectors are all the same. Each connector is keyed so it cannot be inserted backward.

8. Replace the chassis cover and secure it with the four machine screws.
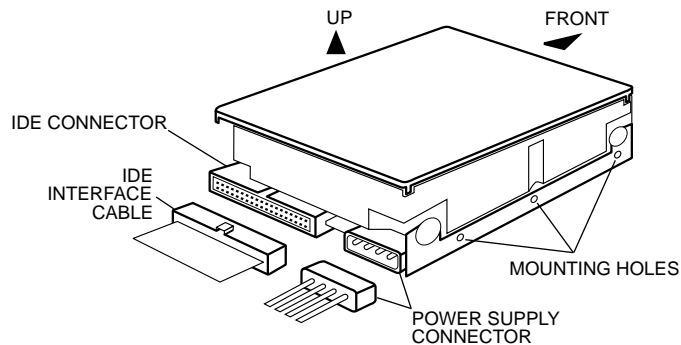
Figure 8.2 IDE Hard Disk Drives

Initializing The Hard Drive

An IDE hard drive must be partitioned and logically formatted. These initialization steps are described in detail in Chapter 5. Unlike ST-506 Interface drives, IDE drives are physically (low-level) formatted by the manufacturer to mark recording surface defects.

1. The DOS FDISK command should be used to partition the hard drive. See your DOS manual for details about this command.

2. The DOS FORMAT command is used to logically format the partition(s) you create with FDISK. See your DOS manual for details about this command.

3. The computer should boot from drive C. If it does, close the case. If not, review your work. If a problem persists, call Swan Technologies for technical assistance.

8.4 Installing A SCSI Hard Drive

This section outlines the procedures for installing and initializing Small Computer Systems Interface (SCSI) drives. We assume that you already have the proper host adapter card installed in your computer.

Installing The Hard Drive

1. Remove the chassis cover, as outlined on page 8-15.

2. Configure the drive. Refer to the drive documentation for specifics. If you intend to add a drive to a computer which already has one drive installed as drive C, set the SCSI Target Address of the new drive to 1. If this new drive is not on the physical end of the drive cable, remove three terminating resistors from the drive. Terminators must be installed on both ends of the SCSI bus cable. Typically, the host adapter is at one end of the cable and is already terminated. The device connected to the end of the SCSI cable should have terminators, as well.

3. Set the "SCSI Parity" Jumpers on the new drive to "Enabled."

4. There are two standard 3 1/2" hard drive brackets inside the chassis--underneath and on the side of the power supply. Remove the hard drive support bracket by pushing the latch spring in, and pulling the bracket out.

5. Slide the drive inside the bracket with the components facing outward. Secure the drive by lining up the holes on the drive and bracket, and putting two screws on each side.

6. Re-attach the whole unit inside the chassis by sliding the support bracket back in till the latch spring snaps in place.

7. Connect the SCSI bus cable to the 50-pin male connector on the back of the drive. The connector is keyed so it cannot be attached backward.

8. Connect one of the available power connectors from the power supply to the back of the drive. The four-wire connectors are all the same. Each connector is keyed so it cannot be inserted backward.

9. Replace the chassis cover and secure it with the four screws.
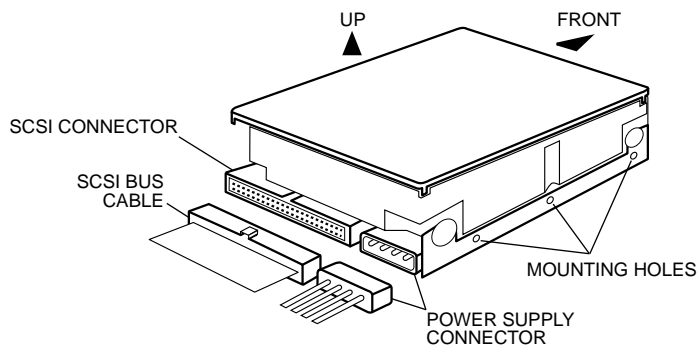
Figure 8.3 SCSI Hard Disk Drives

10. The Adaptec SCSI host adapter displays the following or a similar message during boot up if the second drive has been

installed correctly:

```
Adaptec AT/SCSI BIOS
Ver 3.07
Copyright 1988 Adaptec, Inc.
All Rights Reserved

Checking for SCSI Target 0 LUN 0
SCSI Target 0 LUN 0 Installed as Drive C:
Checking for SCSI Target 0 LUN 1
Checking for SCSI Target 1 LUN 0
SCSI Target 0 LUN 0 Installed as Drive D:
```

11. The computer should boot as normal, but DOS **does not** recognize drive D until it is prepared for use (initialized).

Initializing The Hard Drive

A SCSI hard drive must be partitioned and logically formatted. These initialization steps are described in detail in Chapter 5. Unlike ST-506 Interface drives, SCSI drives are physically formatted by the manufacturer to mark recording surface defects.

1. The DOS FDISK command should be used to partition the hard drive. See your DOS manual for details about this command.

2. The DOS FORMAT command is used to logically format the partition(s) you create with FDISK. See your DOS manual for details about this command.

3. The computer should boot from drive C. If is does, close the case. If not, review your work. If a problem persists, call Swan Technologies for technical assistance.

8.5 Installing A Video Card in a VL Slot

The Swan EISA DB system is shipped with a VL video card, if you ordered the standard configuration. Please refer to the video card manufacturer's documentation before proceeding.

The two VL slots are in-line with the EISA slots on the motherboard and can also be used as an EISA or ISA slot when not occupied by a VESA

local bus card. The VESA VL-Bus local bus connectors on these two slots are 112-pin MCA (Micro Channel Architecture) style connectors.

As a general guide for installing a video card in one of the VL slots, follow these steps:

1. Remove the chassis cover, as outlined on page 8-15.

2. Locate one of the VL expansion slots. Figure S.1 shows the system board with the local bus slots labelled.

3. Remove the metal expansion slot cover from the back of the chassis.

4. Configure the video card according to the manufacturer's instructions.

5. Insert the video card into the slot. Some pressure is normally needed to insert the card into the slot, but do not force the card.

6. Secure the video card with a screw at the back of the chassis.

7. Connect the monitor to the video card.

8. If the VL-Bus card requires configuration via the EISA Configuration Utility, see the video card documentation and the ECU documentation.

9. If the computer boots without error, close the case of the computer by replacing the chassis cover and securing it with the four machine screws. If it will not boot, turn the power off and check your work. If a problem persists, call Swan Technologies for technical assistance.

8.6 Installing an Upgrade Processor

The CPU socket of the Swan EISA DB systems supports a 487SX math coprocessor, OverDrive CPUs, and regular 486 CPUs. If you purchased your EISA DB as a 486SX/25 or 486/33, you can upgrade to one of these processors any time.

To install an upgrade processor, follow these guidelines:

1. Remove the chassis cover, as outlined on page 8-15.

2. Unpack the new chip. Please read the accompanying documentation before proceeding.

3. Gently remove the CPU that is already in the system.

4. Correct orientation of the new processor is very important. There is a notch on one corner of the chip which corresponds to the Pin 1 notch on the socket. Figure S.1 shows the orientation of Pin 1. Gently insert the chip into the socket, with the notch lined up properly.

5. When you change processors, you might have to reset the resistor networks (RNs) and some jumpers on the system board. A chart on page S-3 gives the proper jumper settings for all CPU types. Make sure the jumpers are set to match the new processor. A chart on page S-4 gives the RN settings for each type of processor. Make sure it is properly set for the new processor. Figure 8.5 shows installation of a RN.

6. Replace the chassis cover and secure it with the four screws.

7. Reboot the computer. If it boots without error, your installation was successful. If it won't boot or if it does not recognize the processor, turn the power off and check your work. If a problem persists, call Swan Technologies for technical assistance.

8.7 Installing An Internal Modem

If you take some precautions before installing an internal modem, you reduce the risk of creating conflict between the modem and existing peripherals. Since a modem is a serial device, whether inside or outside the computer, it must use a communication address (COM address), to send data to the CPU. There are four different COM addresses directly supported by DOS, so you must decide which one to assign to the internal modem. Since two physical devices cannot be assigned to the same logical COM address, you must select a COM address for the modem which is not assigned to any other device. The following are the normal addresses and interrupts of the COM ports.

COM Port	Address	Interrupt
COM1	3F8	IRQ4
COM2	2F8	IRQ3
COM3	3E8	IRQ4
COM4	2E8	IRQ3

Your computer may have come with a modem installed in it. Check the manual of your new modem to see if it supports the same address the current one is set to. If so, use that same address. Otherwise, follow these rules to choose a different address.

* Using the above address box, cross off any address taken in your system. If you have Windows installed, at a C: prompt type MSD then press enter. Then press the "C" key and the COM port information should be displayed. The ports marked N/A are available.

* If you have a VGA card that uses an S3 video accelerator chip, cross out COM4 because it is not available. Your video card manual will list which chip it uses.

* Interrupts 3 and 4 may be shared by two separate devices, if they are not used concurrently. For instance, if one of them is a serial mouse under Windows, the interrupt will never be available to another device since the mouse is always active. If that is the case, cross out both the address and interrupt that the mouse uses.

* All Swan computers are configured with two serial ports-- usually COM1 and COM2. In most cases, your serial mouse is on COM1.

* You should now set your modem to whatever address is not crossed out in the box. If you have no available address, you must disable a device or port to avoid conflict with your modem.

Refer to your modem's manual for installation instructions and jumper information. Following are some suggested guidelines.

1. Remove the chassis cover, as outlined on page 8-15.

2. If your computer came with a modem installed in it, remove that modem first and use that slot for the new modem.

3. If you are using a new slot, remove the metal expansion slot cover from the back of the chassis.

4. Configure the modem according to the manufacturer's instructions and the above guidelines. The COM address of the modem must not conflict with other serial devices (such as serial ports)

in your computer.

5. Insert the modem card into the open slot. Some pressure is normally needed, but do not force the card.

6. Secure the modem card with a screw at the back of the chassis.

7. Connect the modular phone cord which comes from the wall jack into the appropriate modular jack on the rear of the modem.

8. Connect your phone into the other modular jack on the rear of the modem card. Whether or not the computer is powered on, your phone should operate normally. It is only when you use your modem that your phone is inoperative.

9. Turn on the computer. If the computer boots, close the case of the computer by replacing the chassis cover and securing it with the four machine screws. If the computer will not boot, turn the power off and check your work. If a problem persists, call Swan Technologies for technical assistance.

10. While it is not necessary to run Setup, it is essential that your communications software be configured for the modem's COM address.

8.8 Installing Additional Memory

The standard Swan EISA DB system has 4096 KB (4 MB) of DRAM. For some applications, you may want or need additional memory.

The system board of the computer provides tremendous flexibility to support many different DRAM configurations. The on-board DRAM is installed with SIMMs (Single-In-Line-Memory Modules). There are four banks of DRAM module slots seated on the system board, which support up to 128 MB of memory.

Two of the banks are each composed of four standard 30-pin SIMM sockets per bank for JEDEC 9-bit modules. These sockets take 1 MB x 9, 4 MB x 9, or 16 MB x 9 SIMMs. The other two banks consist of one 72-pin SIMM socket per bank for JEDEC/IBM 36-bit modules. They take 1 MB x 36 and 4 MB x 36 SIMMs.

The total size of on-board memory depends on the combinations of different sizes of DRAM modules installed on the memory banks. Memory can be configured by installing Resistor Networks (RNs) into five sets of 10-pin RN sockets (RNE1 through RNE5, and RNF1 through RNF5) found beside the SIMMs on the system board. Figure S.1 shows the whole system board. Figure 8.4 shows a close-up of the SIMMs and RNs, and figure 8.5 shows how to install a RN.
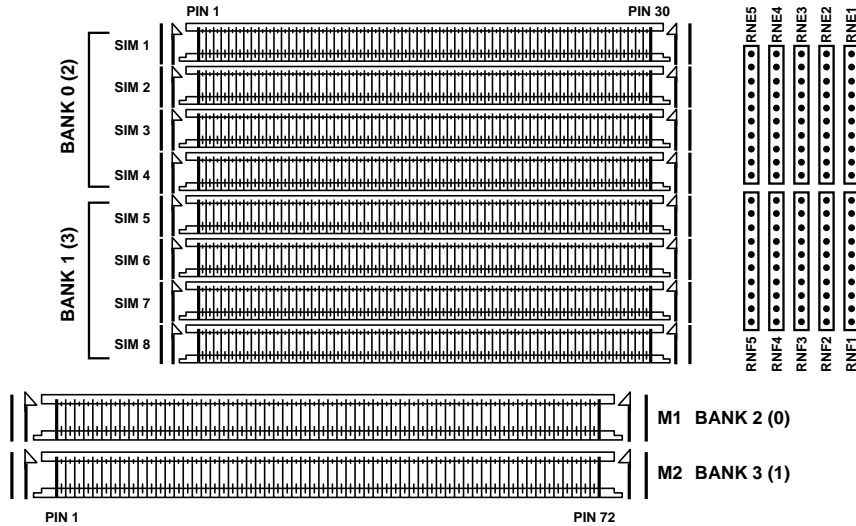
Figure 8.4 SIMMs and Resistor Network Sockets
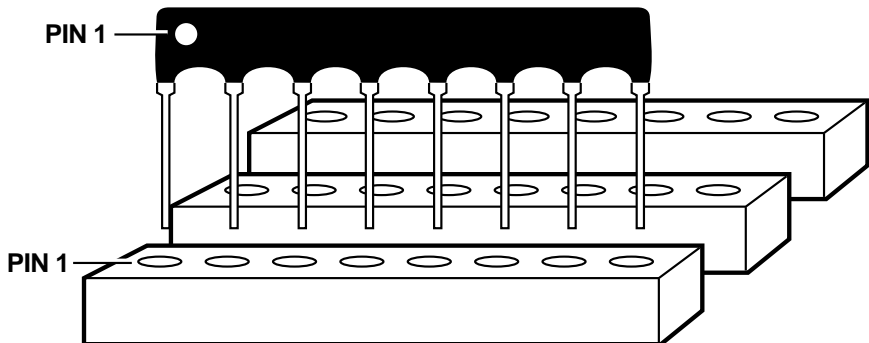
Figure 8.5 Installing a Resistor Network

There are two different ways these banks can be used together for various memory configurations. The following sections will give memory population description, RN setting, and configuration table for each of these cases.

Case 1: Using 9-bit SIMM sockets as Banks 0 + 1 and 36-bit SIMM sockets as Banks 2 + 3

Set the five RNs in sockets RNE1 through RNE5. The 9-bit SIMM sockets, SIMMs 1-8, are assigned as Banks 0 and 1. The 36-bit SIMM sockets, M1 and M2, are assigned as Banks 2 and 3.
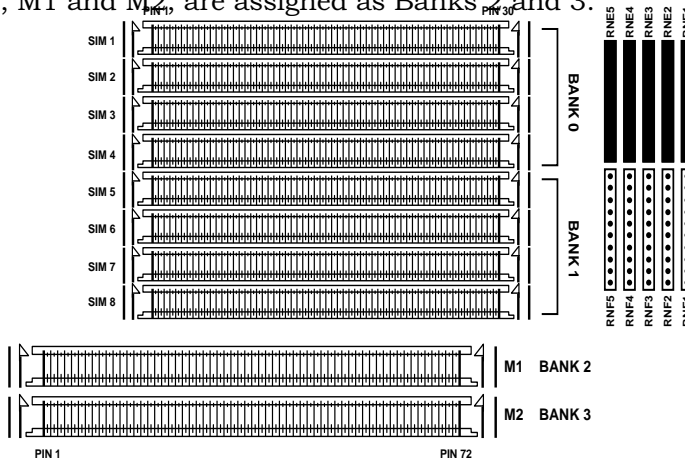
Figure 8.6 Bank Assignments for RNE1 - RNE5 Installed

Table 8.1 Memory Configurations With RNE1 - RNE5

Note: For banks 0 and 1, a bank consists of four 9-bit modules, and for banks 2 and 3, a bank consists of one 36-bit module.

Total Memory	Bank 0	Bank 1	Bank 2	Bank 3
	SIMMs 1-4	SIMMs 5-8	M1	M2
4 MB	1MB x 9			
8 MB	1MB x 9	1MB x 9		
12 MB	1MB x 9	1MB x 9	1MB x 36	
16 MB	1MB x 9	1MB x 9	1MB x 36	1MB x 36
16 MB	4MB x 9			

				continued on next page
20 MB	1MB x 9	4MB x 9		
24 MB	1MB x 9	1MB x 9	4MB x 36	
24 MB	1MB x 9	4MB x 9	1MB x 36	
28 MB	1MB x 9	1MB x 9	4MB x 36	1MB x 36
28 MB	1MB x 9	4MB x 9	1MB x 36	1MB x 36
32 MB	4MB x 9	4MB x 9		
36 MB	1MB x 9	4MB x 9	4MB x 36	
36 MB	4MB x 9	4MB x 9	1MB x 36	
40 MB	1MB x 9	1MB x 9	4MB x 36	4MB x 36
40 MB	1MB x 9	4MB x 9	4MB x 36	1MB x 36
40 MB	4MB x 9	4MB x 9	1MB x 36	1MB x 36
48 MB	4MB x 9	4MB x 9	4MB x 36	
52 MB	1MB x 9	4MB x 9	4MB x 36	4MB x 36
52 MB	4MB x 9	4MB x 9	4MB x 36	1MB x 36
64 MB	4MB x 9	4MB x 9	4MB x 36	4MB x 36
64 MB	16MB x 9			
128 MB	16MB x 9	16MB x 9		

Case 2: Using 36-bit SIMM sockets as Banks 0 + 1 and 9-bit SIMM sockets as Banks 2 + 3.

Set the RNs in sockets RNF1 through RNF5. The 36-bit SIMM sockets, M1 and M2, are assigned as Banks 0 and 1, respectively. The 9-bit SIMM sockets, SIMMs 1-8, are assigned as Banks 2 and 3.
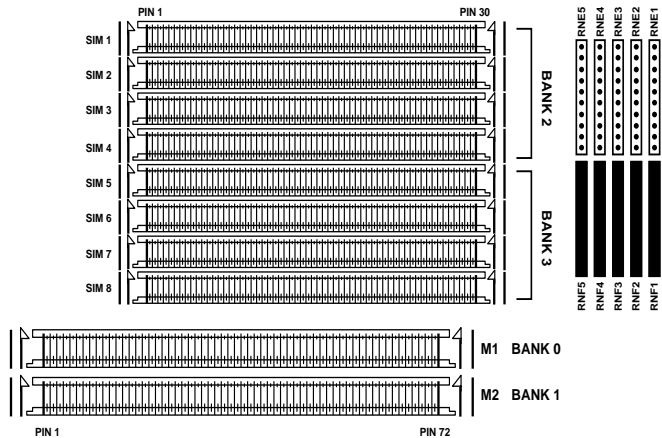
Figure 8.7 Bank Assignments for RNF1 - RNF5 Installed

For banks 0 and 1, a bank consists of one 36-bit SIMM, and for banks 2 and 3, a bank consists of four 9-bit SIMMs.

Table 8.2 Memory Configurations With RNF1 - RNF5

Total Memory	Bank 0 M1	Bank 1 M2	Bank 2 SIMMs 1-4	Bank 3 SIMMs 5-8
4 MB	1MB x 36			
8 MB	1MB x 36	1MB x 36		
12 MB	1MB x 36	1MB x 36	1MB x 9	
16 MB	1MB x 36	1MB x 36	1MB x 9	1MB x 9
16 MB	4MB x 36			
20 MB	1MB x 36	4MB x 36		
24 MB	1MB x 36	1MB x 36	4MB x 9	
24 MB	1MB x 36	4MB x 36	1MB x 9	
28 MB	1MB x 36	1MB x 36	4MB x 9	1MB x 9
28 MB	1MB x 36	4MB x 36	1MB x 9	1MB x 9
32 MB	4MB x 36	4MB x 36		
36 MB	1MB x 36	4MB x 36	4MB x 9	
36 MB	4MB x 36	4MB x 36	1MB x 9	
40 MB	1MB x 36	1MB x 36	4MB x 9	4MB x 9
40 MB	1MB x 36	4MB x 36	4MB x 9	1MB x 9
40 MB	4MB x 36	4MB x 36	1MB x 9	1MB x 9
48 MB	4MB x 36	4MB x 36	4MB x 9	
52 MB	1MB x 36	4MB x 36	4MB x 9	4MB x 9
52 MB	4MB x 36	4MB x 36	4MB x 9	1MB x 9
64 MB	4MB x 36	4MB x 36	4MB x 9	4MB x 9

DRAM Module Insertion

The SIMMs must be seated on the sockets as firmly as possible, but the slots are very fragile, so you must be careful when inserting or removing the module.

1. Place the system board on a cleared, flat surface with the RAM module socket side closest to you.

2. Align the module so the pin-1 marking and corner notch correspond to the SIMM socket pin-1 marking at the rear of the board. The module can fit in the socket only one way, so you do not need to force it.

3. Holding the module at about a 70 degree angle to the socket, insert its gold edge connectors into the socket.

4. Insert the RAM module board into the RAM socket and then carefully press it down until the gold fingers meet the socket bottom.

5. Push the module against the chip arms with your thumbs until a "click" sound is heard; the little plastic tabs appear in the latching holes on the RAM module board and the clip arms fully grab the module board.

6. Replace the chassis cover and secure it with the four machine screws.
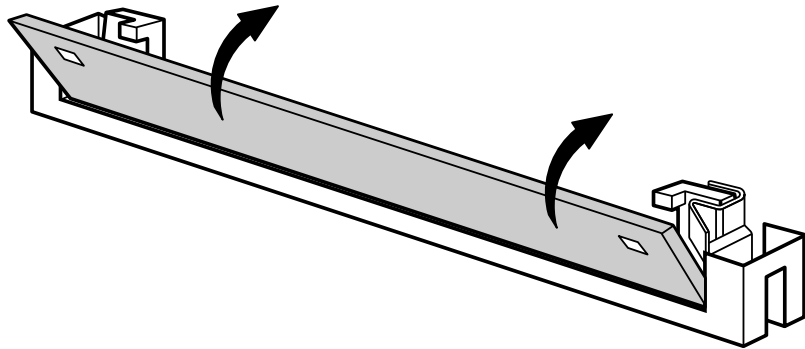
Figure 8.8 Installing DRAM Modules

8.9 Installing External Cache

Your EISA DB system comes standard with 128 KB secondary cache. It has already been installed and pre-configured for you. If you wish to upgrade to 256 KB or 512 KB cache, see Figure 8.12 or 8.13 for the proper installation and configuration of the resistor networks.

The system board holds 64, 128, 256, or 512 KB of cache. The following diagrams show what each configuration should look like. The

resistor networks RNA, RNB, RNC, and RND determine which amount of cache is used. See Figure S.1 for the location of these RNs and the cache sockets on the system board. Figures 8.9, 8.10, 8.11, and 8.12 show the sockets and RNs for each amount.

> **Note**: The system board of the Swan EISA DB supports up to 128 MB of main memory. If you plan to use more than 32 MB of DRAM, you must have at least 128 KB secondary cache. If you plan to use more than 64 MB of DRAM, your system must have at least 256 KB cache. The following chart summarizes the relationship between DRAM and SRAM.

Main Memory Size	**Minimum Required Cache Size**
Up to 32 MB	no minimum
Larger than 32 MB and up to 64 MB	128 KB
larger than 64 MB and up to 128 MB	256 KB

> **Note**: The SRAM sockets U40, U41, U50, and U51 are designed to accept 8K x 8 SRAM (28 pins), 32K x 8 SRAM (28 pins), or 128K x 8 SRAM (32 pins). Please make sure the 28-pin parts are installed properly in the sockets.

64 KB Cache

For 64 KB of cache, the system board takes eight 8K x 8 SRAM chips in sockets U40-U43 and U50-U53, and two 16K x 1 chips in U44 and U55, and one 8K x 8 Tag SRAM chip in U54. The resistor networks should be set to RNA1 and RNA2.
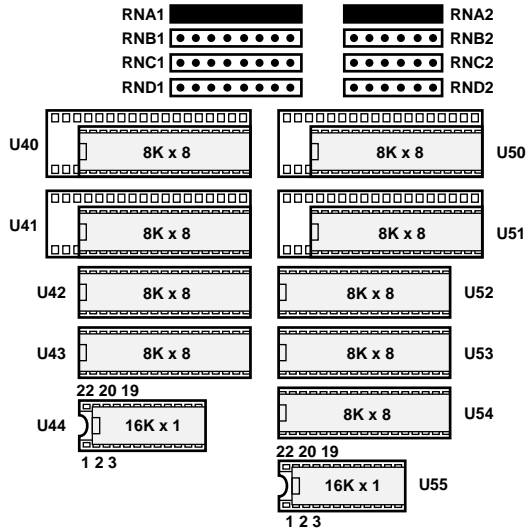
Figure 8.9 64 KB Cache Configuration

128 KB Cache

For 128 KB of cache, the system board takes four 32K x 8 SRAM chips in sockets U40, U41, U50, and U51, one 8K x 8 chip in U54 and two 16K x 1 Tag SRAM chips in U44 and U55. The resistor networks should be set to RNB1 and RNB2.
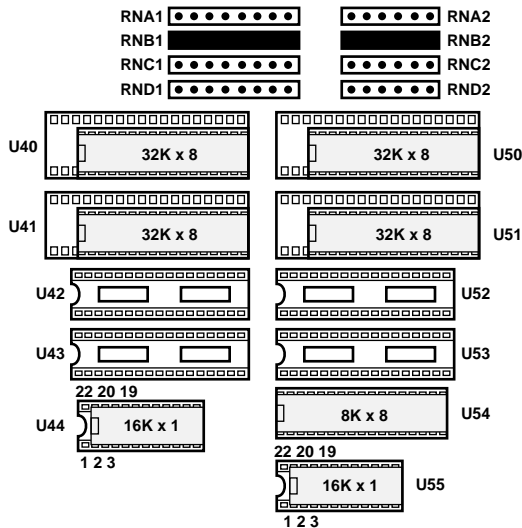
Figure 8.10 128 KB Cache Configuration

256 KB Cache

For 256 KB of cache, the system board takes eight 32K x 8 SRAM chips in sockets U40-U43 and U50-U53, one 32K x 8 chip in U54 and two 16K x 1 Tag SRAM chips in U44 and U55. The resistor networks should be set to RNC1 and RNC2.

Figure 8.11 256 KB Cache Configuration

512 KB Cache

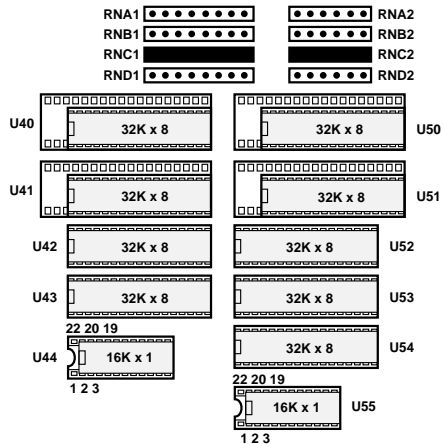For 512 KB of cache, the system board takes four 128K x 8 SRAM chips in sockets U40, U41, U50, and U51, one 32K x 8 chip in U54 and two 64K x 1 Tag SRAM chips in U44 and U55. The resistor networks should be set to RND1 and RND2.
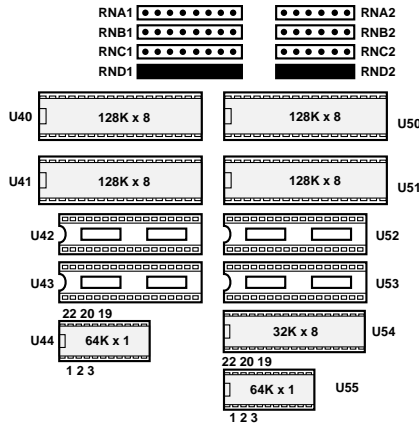
Figure 8.12 512 KB Cache Configuration

8.10 Using the ECU When Installing an EISA Card

The EISA Configuration Utility is a software program that comes with the Swan EISA DB systems which allows the end-user to facilitate proper configuration so that the system operates. There are seven EISA expansion slots on the motherboard, two of which are also VESA VL-Bus local bus slots. Any of the seven slots can be used with any EISA or ISA card, even the VL slots if a VL card is not installed. The EISA bus supports up to six bus mastering devices, so six of the slots are master slots, and one is a bus slave slot.

If you are planning to install an EISA add-in card into your system, run the ECU before you install the card. Every EISA card comes with a corresponding configuration (CFG) file that contains the characteristics and the required system resources for the card.

Before installing the EISA card, bring up the ECU and choose the "Add" or "Add board" option and select the particular add-in card you are installing. The ECU will then inform you which slots are available for the card and which are bus mastering slots.

Note, for ISA add-in cards that come with a CFG, the ECU can also be used to determine their switch/jumper settings so that no conflicts will occur. If an ISA card does not contain a CFG, you must configure it manually.

8.11 Installing A Floppy Drive

If you need to replace a floppy drive, follow these steps.

1. Remove the computer case as outlined on page 8-15. Remove the front bezel by carefully pulling it forward and off.

2. Disconnect the floppy drive data cable. This is a wide, flat ribbon cable that is connected to the back of the floppy drive that is in your system. Remove the power cable also. This may be a tight connection so some force may be necessary when pulling this connector off. Then remove the drive by pressing in on the side clips and pulling it out.

3. Remove the mounting rails from the old drive by removing the two screws on each side.

4. Screw the drive rails onto the sides of the new drive. Mount the rails with the latch toward the front of the drive and line up the front pair of holes. Put the screws in the bottom hole of each pair on each side of the drive. See Figure 8.13.
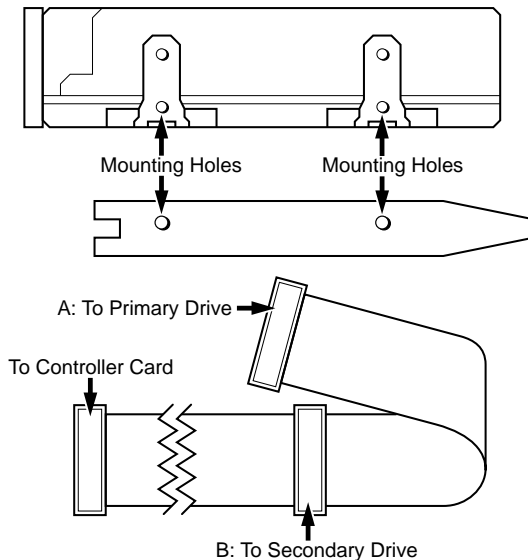
Figure 8.13 Replacing a Floppy Drive

5. If the drive is to be configured as drive B:, connect it to the middle connector on the floppy drive cable. If you are using a twisted braid floppy cable, then the drive select jumpers on both drives should be set to DS1. If you are using a flat cable, set drive A: as DS0, and drive B: as DS1.

6. Slide the drive into the bay. The drive will be locked into the bay simply by inserting it until the latches click into place.

7. Connect the floppy drive controller cable. Polarity is indicated by a red stripe on one edge of the cable, which connects to pin 1 of the edge card connector on the back of the drive.

8. Connect one of the power cables from the power supply to the drive. This connector is keyed to prevent improper connections.

9. Before closing the case, make sure there are no loose parts inside the chassis, then turn the power on. If any warning beeps occur, you have missed something. Check the polarity of the drive controller cable, etc.

10. Run Setup to update the information if necessary. As a test, format a disk from DOS.

11. Replace the chassis cover and secure it with the four machine screws. Replace the front bezel by simply pushing it on the front of the computer till it is in place. The bezel and case cover should meet exactly.

Appendix A: I/O Expansion Slots

The Swan 486V's 16-bit Input/Output (**I/O**) expansion slots (connector channels or I/O slots) are fully IBM PC/AT compatible and share the same pin assignments. These slots are provided for system expansion, which may include the addition of video cards, modems, network adapters, etc.

The expansion slots are part of the **system bus**--the common pathway between components of the computer. When you plug an expansion board into your Swan 486V, you are plugging into the bus. The bus is divided into two channels, one to determine where data is located (**address bus**) and the other to transfer data (**data bus**). A device is said to be "on the I/O channel" if it is connected to the system bus.

B16	DRQ3	B1	GND	A1	-I/O CH CHK	A16	SA15
B17	-DACK1	B2	RESET DRV	A2	SD7	A17	SA14
B18	DRQ1	B3	+5 VDC	A3	SD6	A18	SA13
B19	-REFRESH	B4	IRQ9	A4	SD5	A19	SA12
B20	CLK	B5	-5 VDC	A5	SD4	A20	SA11
B21	IRQ7	B6	DRQ2	A6	SD3	A21	SA10
B22	IRQ6	B7	-12 VDC	A7	SD2	A22	SA9
B23	IRQ5	B8	0WS	A8	SD1	A23	SA8
B24	IRQ4	B9	+12 VDC	A9	SD0	A24	SA7
B25	IRQ3	B10	GND	A10	+I/O CH RDY	A25	SA6
B26	-DACK2	B11	-SMENW	A11	AEN	A26	SA5
B27	T/C	B12	-SMENR	A12	SA19	A27	SA4
B28	BALE	B13	-IOW	A13	SA18	A28	SA3
B29	+5 VDC	B14	-IOR	A14	SA17	A29	SA2
B30	OSC	B15	-DACK3	A15	SA16	A30	SA1
B31	GND					A31	SA0

D10	-DACK5	D1	-MEM CS16	C1	SBHE	C10	-MEMW
D11	DRQ5	D2	-I/O CS16	C2	LA23	C11	SD08
D12	-DACK6	D3	IRQ10	C3	LA22	C12	SD09
D13	DRQ6	D4	IRQ11	C4	LA21	C13	SD10
D14	-DACK7	D5	IRQ12	C5	LA20	C14	SD11
D15	DRQ7	D6	IRQ15	C6	LA19	C15	SD12
D16	+5 VDC	D7	IRQ14	C7	LA18	C16	SD13
D17	-MASTER	D8	-DACK0	C8	LA17	C17	SD14
D18	GND	D9	DRQ0	C9	-MEMR	C18	SD15

Figure B.1 Industry Standard Architecture (ISA) Expansion Slot

Important: The performance of a 16-bit memory card in an expansion slot is limited by the 16-bit bus speed: 8 MHz. It is more efficient to add memory to the Swan 486V system board, which uses its own high-speed (25 or 33MHz) 32-bit bus.

I/O Channel Signal Descriptions

All of the Swan 486V's signal lines are ISA compatible, which means they accept cards intended to work in the IBM PC, XT, or AT. The +5 Volts and Ground (**GND**) lines allow a maximum current of 1 ampere per single contact.

SA0 to SA19 (Input/Output)

Address lines 0 through 19 are used to access memory and I/O devices within the system. These 20 lines provide the processor with a 1 MB address space and, with the addition of LA17 through LA23, allow access of up to 16 MB of memory.

Lines SA0 through SA19 are gated on the system bus when the Bus Address Latch Enable (**BALE**) signal is set high; they are latched on a high-to-low transition (**falling edge**) of the BALE signal. A signal is latched when its logic level is sampled into and held by a memory element that is guaranteed to maintain its current output until set to a different value (a **flip-flop**). These signals are generated by either the microprocessor or by the system board Direct Memory Access (**DMA**) controller; they may also be driven by other microprocessors or DMA controllers on the I/O channel.

LA17 to LA23 (Input/Output)

These unlatched signals are also used to address memory and I/O devices within the system. The signals are valid when BALE is set to high. Lines LA17 through LA23 are not latched during microprocessor cycles, and therefore do not stay valid for the whole cycle; their purpose is to generate memory decodes for the memory cycles. These

decodes should be latched by I/O adapters driven on the falling edge of BALE, and may be driven by other microprocessors or DMA controllers on the I/O channel.

CLK (Output)

This is the system I/O clock, used for synchronization with the microprocessor clock. The **cycle time**, or period, is the minimum time interval between the starts of successive accesses to the processor's registers; it is equal to about 8 MHz. The clock has a 50 percent duty cycle, and should not be used for a fixed-frequency timebase.

RESET DRV (Output)

This signal is used to reset or initialize system logic at either power up time or when the reset button is pressed. This signal is active high.

SD0 through SD15 (Input/Output)

These lines are the 16-bit portion of the system data bus. All 8-bit devices on these lines use only SD0 through SD7. 32-bit data transfers from the processor to the I/O channel take two write cycles to a 16-bit device, and four write cycles to an 8-bit device; this is known as **dynamic bus sizing** and is performed automatically.

BALE (Bus Address Latch Enable) (Output)

This signal is generated by the bus controller and is used to latch the valid addresses and memory decodes from the microprocessor; it is available to the I/O channel as an indicator of valid microprocessor or DMA addresses. BALE is forced high during DMA operations. **DMA** is the process by which information is transferred between two slaves on the bus (i.e. a serial port and memory), under the supervision of a DMA controller.

I/O CH CHK (Input/Output Channel Check) (Input)

This signal provides the system board with parity information about memory on the I/O channel. When this signal is active, it indicates an uncorrectable system error, called a **fatal error**. A system with parity protection includes extra bits that accompany the data and indicate whether the number of 0s (or 1s) in the data are odd or even. One parity bit is used to check the integrity of every eight bits of data in Swan 486V memory.

I/O CHK RDY (Input/Output Check Ready)

This signal is pulled low (not ready) by a memory or I/O device to extend the length of an I/O or memory cycle; any "slow" device should drive it low immediately after detecting its valid address and a read/write command. Machine cycles are extended by an integral number of clock cycles (125 ns). This signal should not be held low for more than 20 clock cycles (2,500 ns).

IRQ3 through IRQ15 (**Interrupt Request lines**)

These lines are used to directly signal the microprocessor that there is an interrupting job that needs attention. The IRQ lines are arranged as follows:

IRQ	Priority
3	7
4	8
5	9
6	10
7	11
8	Not Available, used by Real-Time Clock
9	1
10	2
11	3
12	4
13	Not Available, used by system
14	5
15	6

An IRQ line signals an interrupt on a low-to-high transition (**leading edge**), and must be held high until the microprocessor acknowledges the interrupt request and performs an interrupt service routine. More details are provided in Appendix E.

T/C (**Terminal Count**) (**Output**)

This signal provides a pulse when the terminal count for any DMA channel is reached.

SBHE (**System Bus High Enable**) (**Input/Output**)

This signal indicates a transfer of data on the upper lines of the data bus, SD8 through SD15. It is used to activate the Swan system board's second data buffer to indicate that a 16-bit device is attempting to perform a 16-bit Read or Write.

MASTER (**Input**)

This signal is used with a DRQ line to gain control of the system. A processor or DMA controller on the I/O channel may issue a DRQ to a DMA channel in cascade mode and receive a -DACK. Upon receiving the -DACK, an I/O processor may pull MASTER low, which allows it to control the system address, data, and control lines. After MASTER is low, the I/O microprocessor must wait one system clock period before driving the address and data lines, and two clock cycles before issuing a Read or Write command.

DRAM refreshes are suspended while this signal is low, so it should not be held low for more than 15 microseconds, or system memory may be lost. DRAM chips must be continuously recharged (or **refreshed**) or they lose the data they contain.

MEM CS16 (**Memory 16-bit Chip Select**) (**Input**)

This line, upon going low, signals the system board that the present data transfer will be a 16-bit memory cycle. It must be derived from a decode of LA17 through LA23.

I/O CS16 (**I/O 16-bit Chip Select**) (**Input**)

This line, upon going low, signals the system board that the present data transfer is a 16-bit I/O cycle. It must be derived from a decode of LA17 through LA23.

OSC (Oscillator) (Output)

This oscillator has a period of 70 ns (14.318 MHz), and is not synchronous with the system clock; it has a 50 percent duty cycle.

0WS (Zero Wait State) **(Input)**

This active low signal indicates to the microprocessor that it can complete the present bus cycle without inserting any additional wait cycles. In 16-bit devices, 0WS is derived from an address decode gated with a Read/Write command. Eight-bit devices require a minimum of two wait states.

0WS should be active one system clock cycle after the Read/Write command is active and then gated with the address decode for the device. Memory Read/Write commands are active on the falling edge of the system clock. 0WS is active low.

Appendix B: I/O Port Pin Assignments

Parallel Port Assignments
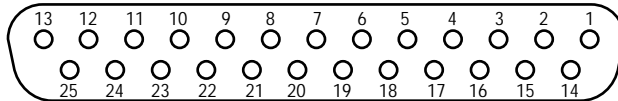
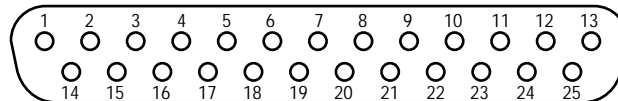|	
1 Strobe	10 Acknowledge
2 Data 0	11 Busy
3 Data 1	12 Paper End
4 Data 2	13 Select
5 Data 3	14 Supply Ground
6 Data 4	15 Error/Osc.
7 Data 5	16 Init/Logic Ground
8 Data 6	17 Select Input/Chassis Ground
9 Data 7	18 +5V
	19-25 Ground

25-Pin Serial Port Assignments

PIN 1	Protective Ground
PIN 2	Transmitted data
PIN 3	Received data
PIN 4	Request to send
PIN 5	Clear to send
PIN 6	Data set ready
PIN 7	Signal Ground/Common Return
PIN 8	Received Line Signal Detector
PIN 9	+ Voltage
PIN 10	- Voltage
PIN 12	Secondary Line Signal Detector
PIN 13	Secondary Clear to Send
PIN 14	Secondary Transmitted Data
PIN 15	DCE Transmitter Signal Element Timing
PIN 16	Secondary Received Data
PIN 17	Receiver Signal Element Timing
PIN 19	Secondary Request to Send
PIN 20	Data Terminal Ready
PIN 21	Signal Quality Detector
PIN 22	Ring Indicator
PIN 23	Data Signal Rate Selector
PIN 24	DTE Transmitter Signal Element Timing

PINS 11,18 and 25 are Undefined

9-Pin Serial Port Assignments
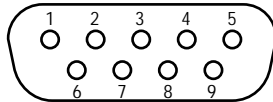
	RS-232C	
PIN	NAME	ASSIGNMENT
Pin 1	CF	Data Carrier Detect (DCD)
Pin 2	BB	Receive Data (RX)
Pin 3	BA	Transmit Data (TX)
Pin 4	CD	Data Terminal Ready (DTR)
Pin 5	AB	Signal Ground (GND)
Pin 6	CC	Data Set Ready (DSR)
Pin 7	CA	Request To Send (RTS)
Pin 8	CB	Clear To Send (CTS)
Pin 9	CE	Ring Indicator (RI)

Appendix C: ASCII Characters

DEC	HEX	CHAR		Description
0	00	^@	NUL	null character
1	01	^A	SOH	start of header
2	02	^B	STX	start of text
3	03	^C	ETX	end of text
4	04	^D	EOT	end of transmit
5	05	^E	ENQ	enquire
6	06	^F	ACK	acknowledge
7	07	^G	BEL	bell
8	08	^H	BS	backspace
9	09	^I	HT	horizontal tab
10	0A	^J	LF	line feed
11	0B	^K	VT	vertical tab
12	0C	^L	FF	form feed
13	0D	^M	CR	carriage return
14	0E	^N	SO	shift out
15	0F	^O	SI	shift in
16	10	^P	DLE	delete
17	11	^Q	DC1	device control 1
18	12	^R	DC2	device control 2
19	13	^S	DC3	device control 3
20	14	^T	DC4	device control 4
21	15	^U	NAK	negative ACK
22	16	^V	SYN	synchronize
23	17	^W	ETB	end of text block
24	18	^X	CAN	cancel
25	19	^Y	EM	end of medium
26	1A	^Z	SUB	substitute
27	1B	^[	ESC	escape
28	1C	^\	FS	file separator
29	1D	^]	GS	group separator
30	1E	^^	RS	record separator
31	1F	^_	US	unit separator

DEC	HEX	CHAR	DEC	HEX	CHAR
32	20	Space	48	30	0
33	21	!	49	31	1
34	22	"	50	32	2
35	23	#	51	33	3
36	24	$	52	34	4
37	25	%	53	35	5
38	26	&	54	36	6
39	27	'	55	37	7
40	28	(	56	38	8
41	29	)	57	39	9
42	2A	*	58	3A	:
43	2B	+	59	3B	;
44	2C	,	60	3C	<
45	2D	-	61	3D	+
46	2E	.	62	3E	>
47	2F	/	63	3F	?

DEC	HEX	CHAR	DEC	HEX	CHAR
64	40	@	80	50	P
65	41	A	81	51	Q
66	42	B	82	52	R
67	43	C	83	53	S
68	44	D	84	54	T
69	45	E	85	55	U
70	46	F	86	56	V
71	47	G	87	57	W
72	48	H	88	58	X
73	49	I	89	59	Y
74	4A	J	90	5A	Z
75	4B	K	91	5B	[
76	4C	L	92	5C	\
77	4D	M	93	5D	]
78	4E	N	94	5E	^
79	4F	O	95	5F	_

DEC	HEX	CHAR		DEC	HEX	CHAR
96	60	'		112	70	p
97	61	a		113	71	q
98	62	b		114	72	r
99	63	c		115	73	s
100	64	d		116	74	t
101	65	e		117	75	u
102	66	f		118	76	v
103	67	g		119	77	w
104	68	h		120	78	x
105	69	i		121	79	y
106	6A	j		122	7A	z
107	6B	k		123	7B	{
108	6C	l		124	7C	|
109	6D	m		125	7D	}
110	6E	n		126	7E	
111	6F	o		127	7F	DEL

Appendix D: Keyboard Scan Code Translation
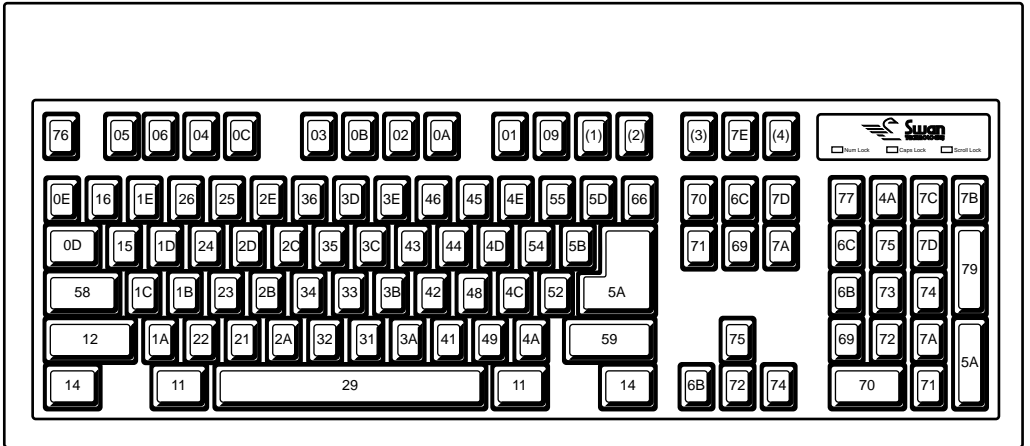
System Scan Code	Key
FF	0
1	76
2	16
3	1E
4	26
5	25
6	2E
7	36
8	3D
9	3E
A	46
B	45
C	4E
D	55
E	66
F	0D

System Scan Code	Key
10	15
11	1D
12	24
13	2D
14	2C
15	35
16	3C
17	43
18	44
19	4D
1A	54
1B	5B
1C	5A
1D	14
1E	1C
1F	1B
20	23
21	2B
22	34
23	33
24	3B
25	42
26	4B
27	4C
28	52
29	0E
2A	12
2B	5D
2C	1A
2D	22
2E	21
2F	2A

System Scan Code	Key
30	32
31	31
32	3A
33	41
34	49
35	4A
36	59
37	7C
38	11
39	29
3A	58
3B	05
3C	06
3D	04
3E	0C
3F	03
40	0B
41	02
42	0A
43	01
44	09
45	77
46	7E
47	6C
48	75
49	7D
4A	7B
4B	6B
4C	73
4D	74
4E	79
4F	69
50	72
51	7A
52	70
53	71
54	7F
55	60

Appendix E: Interrupt Technical Information

E.1 The Interrupt Usage Table

Vector Address	Interrupt	Routine
00-03	0	Divide by zero
04-07	1	Single step
08-0B	2	Non-Maskable Interrupt (**NMI**)
0C-0F	3	Breakpoint
10-13	4	Overflow
14-17	5	ROM BIOS PrintScreen
18-1B	6	Reserved
1C-1F	7	Reserved
20-23	8	IRQ 0 timer tick
24-27	9	IRQ 1 keyboard
28-2B	A	IRQ 2 reserved
2C-2F	B	IRQ 3 serial communications (COM 2)
30-33	C	IRQ 4 serial communications (COM 1)
34-37	D	IRQ 5 parallel printer (LPT 2)
38-3B	E	IRQ 6 floppy disk
3C-3F	F	IRQ 7 parallel printer (LPT 1)
40-43	10	ROM BIOS video driver
44-47	11	ROM BIOS equipment check
48-4B	12	ROM BIOS conventional memory size
4C-4F	13	ROM BIOS disk driver
50-53	14	ROM BIOS communications driver
54-57	15	ROM BIOS I/O system extensions
58-5B	16	ROM BIOS keyboard driver
5C-5F	17	ROM BIOS printer driver
60-63	18	ROM BASIC
64-67	19	ROM BIOS bootstrap
68-6B	1A	ROM BIOS time of day
6C-6F	1B	ROM BIOS Ctrl-break
70-73	1C	ROM BIOS timer tick
74-77	1D	ROM BIOS video parameter table
78-7B	1E	ROM BIOS floppy disk parameters
7C-7F	1F	ROM BIOS font (characters 80h - FFh)

Vector Address	Interrupt	Routine
100-103	40	ROM BIOS floppy disk driver (if hard disk installed)
104-107	41	ROM BIOS hard disk 0 parameters
108-10B	42	ROM BIOS default video driver (if EGA installed)
10C-10F	43	EGA video parameters
110-113	44	EGA, MCGA, VGA character table
114-117	45	reserved
118-10B	46	ROM BIOS hard disk 1 parameters
128-12B	4A	ROM BIOS alarm handler
158-15B	56	Keyboard (if spooler installed)
15C-15F	57	Printer (if spooler installed)

_____

E.2 The BIOS Power-On Self-Test

The following BIOS diagnostic program runs when you reset your computer:

1. The i486 central processing unit (**CPU**), Read Only Memory (**ROM**), Direct Memory Access (**DMA**) controller, timer, Random Access Memory (**RAM**) and keyboard are tested (you do not need to have a keyboard installed).

2. BIOS interrupt vectors are initialized in low memory.

3. The system is configured for memory size, number of serial ports and parallel ports, type of video controller, drive types, and math coprocessor.

4. The CPU scans the memory address range from C0000h to DFFFFh for a ROM. If a ROM is found with the proper format, a call is made to the starting address of the ROM. It is up to the firmware to do a return. This function is available to maintain compatibility with software such as TopView.

Addresses	ROM format expected
00h-01h	ID byte (55AA)
02h	Size of ROM in 512 byte blocks
03h	Starting address of ROM program
Last Byte	Checksum

5. An interrupt 19h boots the disk operating system.

E.3 Interrupt Functions

The following is a summary of the BIOS interrupt functions. When an interrupt provides several functions, each function is described. Interrupt function subfunctions are summarized.

INTERRUPT 05h: PRINT SCREEN
This interrupt sends the information displayed on the monitor to the printer, character by character. Under MS-DOS, this interrupt may be invoked by entering <PrintScrn>.

INTERRUPT 10h: VIDEO

   This interrupt supports three types of displays: a monochrome display adapter (MDA), a color graphics adapter (CGA), and an enhanced graphics adapter (EGA).

   Graphics adapters may be run in graphics or character mode. In graphics mode, characters are generated from a character table in the BIOS. Vector 1Fh points to the character table for the Color graphics adapter; vectors 1Fh and 44h point to the character table for the EGA. In character mode, an on-board character generator is used.

   The following functions are provided by interrupt 10h:

Function 00h - Set Video Mode
   Input registers:
      AH = 00h
      AL = mode

Mode	Format	Pages	Monitor
0	40 x 25 text, mono	8	TV or color
1	40 x 25 text, color	8	TV or color
2	80 x 25 text, mono	4	color
3	80 x 25 text, color	4	color
4	320 x 200x2 graphics	1	color
5	320 x 200x1 graphics	1	color
6	640 x 200 x 1 graphics	1	color
7	80 x 25 text, mono	1	mono
00	40 x 25 text, mono	8	TV or color
01	40 x 25 text, color	8	TV or color
02	80 x 25 text, mono	4	color
03	80 x 25 text, color	4	color
04	320 x 200 x 2 graphics	1	color
05	320 x 200 x 1 graphics	1	color
06	640 x 200 x 4 graphics	1	color
07	80 x 25 text, mono	8	mono
0D	320 x 200 x 4 graphics	8	CGA/EGA
0E	640 x 200 x 4 graphics	4	CGA/EGA
0F	640 x 350 x 1 graphics	2	EGA/mono
10	640 x 350 x 4 graphics	2	EGA

Function 01h - Set Cursor Type
        Input registers:
                AH = 01h
                CH = start line for cursor (bits 0-4)
                CL = end line for cursor (bits 0-4)

Function 02h - Set Cursor Position
        Input registers:
                AH = 02h
                DH,DL = row, column
                BH = page

Function 03h -. Get Cursor Position
        Input registers:
                AH = 03h
                BH = page
        Output registers:
                DH,DL = row, column
                CX = cursor mode (see type)

Function 04h - Get Light Pen Position
        Input register:
                AH = 04h
        Output registers:
                AH = 0 light pen inactive, 1 light pen active
                DH,DL = row, column
                CH = raster Line
                BX = pixel column

Function 05h - Set Display Page
        Input registers
                AH = 05h
                AL = page

Function 06h - Initialize or Scroll Up Window
        Input registers:
                AH = 06h
                AL = number of rows to scroll up
                    (if 0, entire block is blanked)
                DH,DL = row, column of lower right corner of block
                BH = attribute of blank characters for vacated lines

Function 07h - Initialize or Scroll Down Window
        Input registers:
                AH = 07h
                AL = number of rows to scroll down
                    (if 0, entire block is blanked)
                CH,CL = row, column of upper left corner of block
                DH,DL = row, column of lower right corner of block
                BH = attribute of blank characters for vacated lines

Function 08h - Read Character And Attribute At Cursor
        Input registers:
                AH = 08h
                BH = page
        Output registers:
                AL = character
                AH = attribute (character mode only)

Function 09h - Write Character And Attribute At Cursor
        Input registers:
                AH = 09h
                AL = character
                BH = page
                BL = attribute (character mode only)
                CX = number of characters to write

Function 0Ah - Write Character At Cursor
        Input registers:
                AH = 0Ah
                AL = character
                BH = page
                CX = number of characters to write

Function 0Bh - Set Palette
        Input registers:
                AH = 0Bh
                BH = 01h
                BL = palette
                        00h green, red, brown/yellow
                        01h cyan, magenta, white

Function 0Ch - Write Graphics Pixel
       Input registers:
              AH = 0Ch
              AL = dot value
              CX = column (in pixels)
              DX = row (in pixels)

Function 0Dh - Read Graphics Pixel
       Input registers:
              AH = 0Dh
              CX = column (in pixels)
              DX = row (in pixels)
       Output register:
              AL = dot value

Function 0Eh - Write Character In Teletype Mode
       Input registers:
              AH = 0Eh
              AL = character
              BL = foreground color (graphics only)

Function 0Fh - Get Video Mode
       Input register:
              AH =0F
       Output registers:
              AL = mode
              AH = number of columns
              BH = active page

Function 10h - Palette, Border & Color Subfunctions
       Input register summary:
              AH = 10h
              AL = subfunction (00h-1Bh)
              BH = color value, paging mode, page
              BL = palette register, blink/intensity toggle
              BX = color register, first color register
              CH = green value
              CL = blue value
              CX = number of color registers
              DH = red value
              ES:DX = segment:offset of color list or buffer

Function 11h - Font and Controller Subfunctions
        Input register summary:
                AH = 11h
                AL = type of load
                BL = block, character rows specifier
                BH = points (bytes per character)
                CX = number of characters defined by table
                DL = character rows per screen
                DX = first character code in table
                ES:BP = segment: offset of font table

Function 12h - Default Configuration Subfunctions
        Input register summary:
                AH = 12
                BL = subfunction (10h-36h)
                AL = scan line code, default palette loading,
                    I/O port/buffer access, gray-scale summing,
                    cursor emulation, active display, refresh
                ES:DX = segment:offset of 128-byte buffer

Function 13h - Write String in EGA Teletype Mode
        Input registers:
                AH = 13
                AL = write mode (00h-03h)
                BH = page
                BL = attribute, if AL = 00h or 01h
                CX = length of character string
                DH = y coordinate (row)
                DL = x coordinate (column)
                ES:BP = segment:offset of string

INTERRUPT 11h GET EQUIPMENT CONFIGURATION

Output register:
    AX = equipment list code word

Bit(s)	Function
14-15	number of parallel ports installed
13	reserved
12	joystick installed
9-11	number of serial ports
8	reserved
6-7	number of floppy disk drives (if bit 0=1)
	00 = 1 floppy drive
	01 = 2 floppy drives
	10 = 3 floppy drives
	11 = 4 floppy drives
4-5	video mode at boot time
	00 = no display
	01 = 40 x 25 using color display
	10 = 80 x 25 using color display
	11 = 80 x 25 using monochrome
2-3	reserved
1	1 if math coprocessor installed
0	1 if floppy disk installed

INTERRUPT 12h GET CONVENTIONAL MEMORY SIZE

Output register:
    AX = memory size (in KB)

Note: The value returned is the amount of *functional* memory found during the Power-On Self-Test, regardless of the memory size configuration information found in CMOS RAM. The value does not reflect any extended memory (above the 1 MB boundary) that may be in the Swan 486V.

INTERRUPT 13h DISK AND FLOPPY FUNCTIONS

A wide variety of disk system functions are provided by interrupt 13h:

Function 00h - Reset Disk System
        Input registers:
                AH = 00h
                DL = 00h-7Fh if floppy disk, 80h-FFh if hard drive
        Output registers:
                AH = 0 if reset successful, status if error
                CF = 0 if reset successful, 1 if error

Function 01h - Get Status of Most Recent Disk Operation
        Input registers:
                AH = 01h
                DL = 00h-7Fh if floppy, 80h-FFh if hard drive
        Output registers:
                AH = 00h
                AL = 00h if no error, or disk system status code

Code	Floppy Drive Status
01h	illegal command
02h	address mark not found
03h	diskette write-protected
04h	sector not found
06h	diskette removed
08h	Direct Memory Access (**DMA**) overrun
09h	DMA crossed 64 KB memory boundary
0Ch	media type not found
10h	Cyclic Redundancy Check (**CRC**) error
20h	floppy drive controller failure
40h	seek failure
80h	floppy drive timeout error

Code   Hard Drive Status
01h   illegal command
02h   address mark not found
04h   sector not found
05h   reset failed
07h   bad parameter table
09h   DMA crossed 64 KB memory boundary
0Ah   bad sector flag
0Bh   bad track flag
0Dh   invalid number of sectors on format
0Eh   control data address mark detected
0Fh   DMA arbitration level out of range
10h   uncorrectable Error Correction Code
          (**ECC**) error
11h   ECC corrected data error
          during preceding sector read
20h   hard disk controller failure
40h   seek failure
80h   hard disk timeout error
BBh   undefined error
CCh   write fault
E0h   status register error
FFh   sense operation failed

Function 02h - Read Sector
    Input registers:
        AH = 02h
        AL = sector number
        CH = cylinder
        CL = sector
        DH = head
        DL = drive number
        ES:BX = address of memory buffer
    Output registers:
        AH = 0 if read successful, status code if error
        (see interrupt 13h function 01h for status codes)
        AL = number of transferred sectors if no error
        CF = 0 if read successful, 1 if error

Function 03h - Write Sector
  Input registers:
    AH = 03h
    AL = sector number
    CH = cylinder
    CL = sector
    DL = 00h-7Fh if floppy, 80h-FFh if hard drive
    ES:BX = address of memory buffer
  Output registers:
    AH = 0 if write successful, status code if error
    (see interrupt 13h function 01h for status codes)
    AL = number of transferred sectors if no error
    CF = 0 if write successful, 1 if error

Function 04h - Verify Sector
  Input registers:
    AH = 03h
    AL = sector number
    CH = cylinder
    CL = sector
    DL = 00h-7Fh if floppy, 80h-FFh if hard drive
    ES:BX = address of memory buffer
  Output registers:
    AH = 0 if verify successful, status code if error
    (see interrupt 13h function 01h for status codes)
    AL = number of verified sectors if no error
    CF = 0 if verify successful, 1 if error

Function 05h - Format Track
  Input registers:
    AH = 05h
    AL = interleave (01-16)
    CH = cylinder
    CL = sector
    DH = head
    DL = 00h-7Fh if floppy, 80h-FFh if hard drive
    ES:BX = address of memory buffer
  Output registers:
    AH = 0 if format successful, status code if error
    (see interrupt 13h function 01h for status codes)
    CF = 0 if format successful, 1 if error

Function 06h - Format Bad Track
        Input registers:
                AH = 06h
                AL = interleave (01-16)
                CH = cylinder
                DH = head
                DL = 00h-7Fh if floppy, 80h-FFh if hard drive
        Output registers:
                AH = 0 if format successful, status code if error
                (see interrupt 13h function 01h for status codes)
                CF = 0 if format successful, 1 if error

Function 07h - Format Drive
        Input registers:
                AH = 07h
                AL = interleave (01-16)
                CH = starting cylinder
                DL = 00h-7Fh if floppy, 80h-FFh if hard drive
        Output registers:
                AH = 0 if format successful, status code if error
                (see interrupt 13h function 01h for status codes)
                CF = 0 if format successful, 1 if error

Function 08h - Get Drive Parameters
        Input registers:
                AH = 08h
                DL = 00h-7Fh if floppy, 80h-FFh if hard drive
        Output registers:
                AH = status
                BL = drive type
                CH = maximum cylinders
                CL = sectors per track
                DH = maximum heads
                DL = number of drives
                CF = 0 if successful, 1 if error
                ES:DI = segment:offset of disk drive parameter table

Function 09h - Initialize Hard Drive Characteristics
> Input registers:
>> AH = 09h
>> DL = 00h-7Fh if floppy, 80h-FFh if hard drive
> Output registers:
>> AH = 0 if successful, status code if error
>> (see interrupt 13h function 01h for status codes)
>> CF = 0 if successful, 1 if error

Function 10h - Read Sector Long
> Input registers:
>> AH = 0Ah
>> AL = sector number
>> CH = cylinder
>> CL = sector
>> DL = drive (80h-FFh)
>> DH = head
>> ES:BX = address of memory buffer
> Output registers:
>> AH = 0 if read successful, status code if error
>> (see interrupt 13h function 01h for status codes)
>> AL = number of transferred sectors if no error
>> CF = 0 if read successful, 1 if error

Function 0Bh - Write Sector Long
> Input registers:
>> AH = 0Ah
>> AL = sector number
>> CH = cylinder
>> CL = sector
>> DL = drive (80h-FFh)
>> DH = head
>> ES:BX = address of memory buffer
> Output registers:
>> AH = 0 if write successful, status code if error
>> (see interrupt 13h function 01h for status codes)
>> AL = number of transferred sectors if no error
>> CF = 0 if write successful, 1 if error

Function 0Ch - Seek
        Input registers:
                AH = 0Ch
                CH = lower 8 bits of cylinder
                CL = upper 2 bits of cylinder in bits 6-7
                DH = head
                DL = drive (80h-FFh)
        Output registers:
                AH = 0 if seek successful, status code if error
                (see interrupt 13h function 01h for status codes)
                CF = 0 if seek successful, 1 if error

Function 0Eh - Read Sector Buffer
        Input registers:
                AH = 0Eh
                ES:BX = segment:offest of memory buffer
        Output registers:
                AH = 0 if successful, status code if error
                (see interrupt 13h function 01h for status codes)
                CF = 0 if read successful, 1 if error

Function 0Fh - Write Sector Buffer
        Input registers:
                AH = 0Fh
                ES:BX = segment:offest of memory buffer
        Output registers:
                AH = 0 if write successful, status code if error
                (see interrupt 13h function 01h for status codes)
                CF = 0 if write successful, 1 if error

Function 10h - Get Drive Status
        Input registers:
                AH = 10h
                DL = drive (80h-FFh)
        Output registers:
                AH = 0 if successful, status code if error
                (see interrupt 13h function 01h for status codes)
                CF = 0 if successful, 1 if error

Function 11h - Recalibrate Drive
    Input registers:
        AH = 11h
        DL = drive (80h-FFh)
    Output registers:
        AH = 0 if successful, status code if error
        (see interrupt 13h function 01h for status codes)
        CF = 0 if successful, 1 if error

Function 12h - Controller RAM Diagnostic
    Input register:
        AH = 12h
    Output registers:
        AH = 0 if successful, status code if error
        (see interrupt 13h function 01h for status codes)
        CF = 0 if successful, 1 if error

Function 13h - Controller Drive Diagnostic
    Input register:
        AH = 13h
    Output registers:
        AH = 0 if successful, status code if error
        (see interrupt 13h function 01h for status codes)
        CF = 0 if successful, 1 if error

Function 14h - Controller Internal Diagnostic
    Input register:
        AH = 14h
    Output registers:
        AH = 0 if successful, status code if error
        (see interrupt 13h function 01h for status codes)
        CF = 0 if successful, 1 if error

Function 15h - Get Disk Type
    Input registers:
        AH = 15h
        DL = 00h-7Fh if floppy, 80h-FFh if hard drive
    Output registers:
        AH = drive type code if no error
            00 no drive present
            01 floppy disk drive w./out change line support
            02 floppy disk drive with change line support

03 hard drive
AH = status code if error
(see interrupt 13h function 01h for status codes)
CX:DX = number of 512-byte sectors
CF = 0 if successful, 1 if error

Function 16h - Get Disk Type
      Input registers:
          AH = 16h
          DL = drive (00h-7Fh)
      Output registers:
          AH = change line status
               00 inactive
               01 active
          CF = clear if inactive, set if active

Function 17h - Set Disk Type
      Input registers:
          AH = 17h
          AL = floppy diskette type code (00-04)
          DL = drive (00h-7Fh)
      Output registers:
          AH = 0 if successful, status code if error
          (see interrupt 13h function 01h for status codes)
          CF = 0 if successful, 1 if error

Function 18h - Set Disk Type
      Input registers:
          AH = 18h
          CH = number of cylinders
          CL = sectors per track
          DL = drive (00h-7Fh)
      Output registers:
          AH = 0 if successful, status code if error
          (see interrupt 13h function 01h for status codes)
          CF = 0 if successful, 1 if error
          ES:DI = segment:offset of disk parameter media table

INTERRUPT 14h SERIAL PORT INTERRUPT

The functions provided by interrupt 14h support asynchronous serial ports COM1, COM2, COM3, and COM4. The base address for the timeout value of each port is stored in low memory. The address and timeout location of each port in hexadecimal are:

Port	Address	Timeout Location
COM1	00400h	00470h
COM2	00402h	0047Dh
COM3	00404h	0047Eh
COM4	00406h	0047Fh

The following functions are provided by interrupt 14h:

Function 00h - Initialize Universal Asynchronous Receiver/Transmitter (**UART**)
>   Input registers:
>   AH = 00h
>   AL = UART parameters

The UART parameters are:

Parameter:	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Baud rate:								
110	0	0	0					
150	0	0	1					
300	0	1	0					
600	0	1	1					
1200	1	0	0					
2400	1	0	1					
4800	1	1	0					
9600	1	1	1					
Parity:								
none				0	0			
odd				0	1			
none				1	0			
even				1	1			
Stops Bits:								
1						0		
2						1		
Data bits:								
7							1	0
8							1	1

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```
DX =    0 for COM1
        1 for COM2
        2 for COM3
        3 for COM4
```

Output register:
      AX = status

Bit	**Function**
15	timeout
14	transmitter shift register empty
13	transmitter holding register empty
12	break detected
11	framing error detected
10	parity error detected
09	overrun error detected
08	data receive ready
07	Data Carrier Detect (**DCD**)
06	ring
05	Data Set Ready (**DSR**)
04	Clear To Send (**CTS**)
03	change in DCD
02	ring stopped
01	change in DSR
00	change in CTS

Function 01h - Write Character to Communications Port

Note: This function sets Data Terminal Ready (**DTR**) and Ready To Send (**RTS**), and waits for DSR and CTS. If these signals are not set, a timeout error occurs.

Input registers:
AH = 01h
DX = communications port number
0 COM1, 1 COM2, 2 COM3, 3 COM4
Output registers:
AH = status

Bit	Function
07	timeout
06	transmitter shift register empty
05	transmitter hold register empty
04	break detected
03	framing error detected
02	parity error detected
01	overrun error detected
00	data ready

AL = transmit character, 1 if timeout error

Function 02h - Read Character From Communications Port

Note: This function sets Data Terminal Ready (**DTR**) and waits for DSR. If it is not set, a timeout error occurs. If DSR is set, the function waits for a receive character. If the character is not received, a timeout occurs.

Input registers:
AH = 02h
DX = communications port number
0 COM1, 1 COM2, 2 COM3, 3 COM4

Output registers:
AH = status

Bit	Function
07	timeout
06	not used
05	not used
04	break detected
03	framing error detected
02	parity error detected
01	overrun error detected
00	not used

Function 03h - Get Communications Port Status
Input registers:
AH = 03h
DX = communications port number
0 COM1, 1 COM2, 2 COM3, 3 COM4
Output register:
AX = status
(see interrupt 14h function 00h for status codes)

INTERRUPT 15h SYSTEM SERVICES

The following functions are provided by interrupt 15h for system devices
(i.e. cassette, joystick, pointing device, etc.):

Functions 00h-7Fh - Cassette I/O Functions

> **Note**: These IBM PC functions are left over from the time when
> audio cassettes were a common storage media. We
> provide the entry points for compatibility purposes but
> registers AH and CF will always return 86h and 01h,
> indicating the device is not present.

Input registers:
AH = 00h through 7F
Output registers:
AH = 86h
CF = 01h

Function 80h - Device Open
    Input registers:
        AH = 80h
        BX = device ID
        CX = Process ID
    Output registers:
        AH = 0 if open successful, status if error
        CF = 0 if open successful, 1 if error

Function 81h - Device Close
    Input registers:
        AH = 81h
        BX = device ID
        CX = Process ID
    Output registers:
        AH = 0 if close successful, status if error
        CF = 0 if close successful, 1 if error

Function 82h - Process Termination
    Input registers:
        AH = 82h
        BX process ID
    Output registers:
        AH = 0 if terminate successful, status if error
        CF = 0 if terminate successful, 1 if error

Function 83h - Event Wait
    Input registers:
        AH = 83h
        AL = 0 to set an interval
             1 to cancel event wait
        CD:DX = wait time in microseconds
        ES:BX = segment:offset of semaphore byte
    Output registers:
        AH = 0 if successful, status if error
        CF = 0 if successful, 1 if error

Function 84h - Read Joystick Status
    Input registers:
        AH = 84h
        DX = subfunction
             00 read switch settings
             01 read the resistance across inputs

Output registers:
       CF = 0 if status read, 1 if error
       If DX = 00h
           AL = switch settings (bits 4-7)
       If DX = 01h
           AX,BX = resistor A(x,y) value
           CX,DX = resistor B(x,y) value

Function 85h - System Request Key
    Input register:
       AH = 85h
    Output registers:
       AL = 00h make of key
           01h break of key

Function 86h - Process Delay
    Input registers:
       AH = 86h
       CX,DX = microseconds to wait
    Output register:
       CF = 0 if wait performed, 1 if error

Function 87h - Move Extended Memory Block
    Input registers:
       AH = 87h
       CX = number of words to move
       ES:SI = segment:offset of global descriptor table
    Output registers:
       AH = 0 if move successful, status if error
       CF = 0 if move successful, 1 if move unsuccessful

Function 88h - Get Extended Memory Size
    Input registers:
       AH = 88h
    Output register:
       AX = extended memory in 1024 byte blocks

Function 89h - Enter Protected Mode
    Input registers
       AH = 89h
       BH = interrupt number for IRQ0
       BL = interrupt number for IRQ8
       ES:SI = segment:offset of global descriptor table

Output registers:
    AH = 0 if successful
    CS, DS, ES and SS = user-defined selectors
    CF = 0 if CPU in protected mode, 1 if CPU in real mode

> **Note:** In this instance, the 80486 chip is behaving exactly like an 80386. The protected and the virtual mode in the 80286 and 80386 are not the same. To use this function properly, refer to the Intel *i386DX Programmer's Reference Manual*. Please note that the i386DX sets flags differently than does the 80286.

Function 90h - Device Wait
    Input registers:
        AH = 90h
        AL = device type
            00h disk
            01h diskette
            02h keyboard
            03h pointing device
            80h network
            FCh hard drive reset
            FDh diskette motor start
            FEh printer
    Output registers:
        AH = 00h if no wait performed
        CF = 0 if not wait performed, 1 if wait performed

Function 91h - Device Post (I/O Completion)
    Input registers:
        AH = 91h
        AL = device type
            00h disk
            01h diskette
            02h keyboard
            03h pointing device
            80h network
    Output register:
        AH = 00h

Function C0h - Get System Environment
        Input register:
                AH = C0h
        Output registers:
                ES:BX = segment:offset of configuration table

INTERRUPT 16h KEYBOARD INTERRUPT

Interrupt 16h provides the following functions for your keyboard:

Function 00h - Read Character From Keyboard
        Input registers:
                AH = 00h
        Output registers:
                AH = keyboard scan mode
                AL = ASCII character

Function 01h - Get Keyboard Status
        Input registers:
                AH = 01h
        Output registers:
                AH = keyboard scan code (if ZF=0)
                AL = character (if ZF=0)
                ZF = buffer status
                        00h character available
                        01h no character available

Function 02h - Get Keyboard Flags
        Input register:
                AH = 02h
        Output register:
                AL = flag status

Bit	Function
07	insert mode
06	Caps lock mode
05	Num lock mode
04	Scroll mode
03	Alt key depressed
02	Ctrl key depressed
01	left shift key depressed
00	right shift key depressed

Function 03h - Set Repeat Rate
        Input registers:
                AH = 03h
                AL = 05h
                BH = repeat delay
                BL = repeat rate
        Output registers:
                AH = 03h
                AL = subfunction

                        00 restore default delay and rate
                        01 increase initial delay
                        02 decrease repeat rate
                        03 increase delay and decrease repeat rate
                        04 disable keyboard repeat

Function 05h - Push Character and Scan Code
        Input registers:
                AH = 05h
                CH = scan code
                CL = character
        Output registers:
                AL = 0 if successful, 1 if error
                CF = 0 if successful, 1 if buffer full

Function 10h - Read Character from Enhanced Keyboard
        Input register:
                AH = 10h
        Output registers:
                AH = keyboard scan code
                AL = ASCII character

Function 11h - Get Enhanced Keyboard Status
        Input register:
                AH = 11h
        Output registers:
                AH = keyboard scan code (if ZF=0)
                AL = ASCII character (if ZF=0)
                ZF = 0 in key waiting to be input, 1 if no key waiting

Function 12h - Get Enhanced Keyboard Flags
    Input register:
        AH = 12h
    Output register:
        AX = flags

Bit	**Significance**
00h	right Shift key down
01h	left Shift key down
02h	either Ctrl key down
03h	either Alt key down
04h	Scroll Lock toggle on
05h	Num Lock toggle on
06h	Caps Lock toggle on
07h	Insert toggle on
08h	left Ctrl key down
09h	left Alt key down
0Ah	right Ctrl key down
0Bh	right Alt key down
0Ch	Scroll key down
0Eh	Num Lock key down
0Dh	Caps Lock key down
0Fh	SysReq key down

INTERRUPT 17h PARALLEL PORT INTERRUPT

The functions provided by interrupt 17h support up to four printers: LPT1, LPT2, LPT3 and LPT4. The base address and timeout location for each printer label is stored in low memory. These values are:

Port	**Address**	**Timeout Location**
LPT1	00408h	00478h
LPT2	0040Ah	00479h
LPT3	0040Ch	0047Ah
LPT4	0040Eh	0047Bh

Function 00h - Print Character
 Input registers:
  AH = 00h
  AL = character to be printed
  DX = printer assignment
   0 LPT1, 1 LPT2, 2 LPT3, 3 LPT4
 Output register:
  AH = status

Bit	**Function**
07	printer not busy
06	printer acknowledge
05	out of paper
04	select on
03	I/O error
02	not used
01	not used
00	timeout error

Function 01h - Initialize Printer
 Input registers:
  AH = 01h
  DX = printer assignment
   0 LPT1, 1 LPT2, 2 LPT3, 3 LPT4
 Output register:
  AH = status
  (see interrupt 17h function 00h for status codes)

Function 02h - Get Printer Status
 Input registers:
  AH = 02h
  DX = printer assignment
   0 LPT1, 1 LPT2, 2 LPT3, 3 LPT4
 Output register:
  AH = status
  (see interrupt 17h function 00h for status codes)

INTERRUPT 18h ROM BASIC

INTERRUPT 19h REBOOT THE SYSTEM

INTERRUPT 1Ah SYSTEM TIME INTERRUPT

These interrupt functions handle the system date and time. The timer resets to zero every 24 hours.

Function 00h - Get Tick Count
        Input register:
                AH = 00h
        Output registers:
                AL = roll-over flag
                        00h if midnight not passed since last read
                        <>00h if midnight was passed since last read
                CX = high portion of count
                DX = low portion of count

Function 01h - Set Tick Count
        Input registers:
                AH = 01h
                CX = high portion of count
                DX = low portion of count

Function 02h - Get Clock Time
        Input register:
                AH = 02h
        Output registers:
                CH = hours in Binary Coded Decimal (**BCD**)
                CL = minutes in BCD

Function 03h - Set Clock Time
        Input registers:
                AH = 03h
                CH = hours in BCD
                CL = minutes in BCD
                DH = seconds in BCD
                DL = daylight saving time code
                        00h standard time
                        01h daylight saving time

Function 04h - Get Date
        Input register:

AH = 04h
Output registers:
    CH = century (19 or 20) in BCD
    CL = year in BCD
    DH = month in BCD
    DL = day in BCD
    CF = 0 if clock running, 1 if clock stopped

Function 05h - Set Date
    Input registers:
        AH = 04h
        CH = century (19 or 20) in BCD
        CL = year in BCD
        DH = month in BCD
        DL = day in BCD

INTERRUPT 1Bh <Ctrl><Brk>

Interrupt 1Bh is caused by a break signal from the keyboard (<Ctrl><Break>). While interrupt 1Bh returns nothing, the user may define a custom function here.

INTERRUPT 1Ch TIMER INTERRUPT

Function 1Ch occurs with every timer interrupt. While this interrupt is normally set to return, the user may define a customer function here.

_____

E.4 System Interrupt IRQ Listing

Function	**Level**
I/O Channel check	Processor NMI
Timer output 0	IRQ 0
Keyboard buffer full	IRQ 1
Interrupt from controller 2	IRQ 2
Real Time Clock (**RTC**) interrupts	IRQ 8
Software redirect to IRQ 2	IRQ 9

Available	IRQ 10
Available	IRQ 11
Available	IRQ 12
Math coprocessor	IRQ 13
Hard drive controller	IRQ 14
Available	IRQ 15
Serial port 2	IRQ 3
Serial port 1	IRQ 4
Parallel port 2	IRQ 5
Diskette controller	IRQ 6
Parallel port 1	IRQ 7

Appendix F: I/O Port Usage

I/O Port Usage

Hex Address	Function
000-01F	DMA controller 1
020-03F	Interrupt controller 1, Bus master
022-023	System configuration
040-05F	Timer
060-06F	Keyboard controller, 8742
070-07F	Real Time Clock (NMI)
080-09F	DMA page registers
0A0-0BF	Interrupt controller 2
0C0-0DF	DMA controller 2
0F0-0F1	Clear math coprocessor busy
1F0-1F8	Fixed disk
200-207	Game I/O port
278-27F	Parallel printer port 2
2F8-2FF	Serial port 2
300-31F	Prototype card
360-36F	Reserved
370-377	Secondary floppy drive controller
378-37F	Parallel printer port 1
380-38F	SDLC, Bisynchronous port 2
3A0-3AF	Bisynchronous port 1
3B0-3BF	Monochrome Display Adapter (& EGA)
3C0-3CF	Enhanced Graphics Adapter
3D0-3DF	Color Graphic Adapter (& EGA)
3F0-3F7	Floppy drive controller
3F8-3FF	Serial port 1

Appendix G: DMA Channels And Page Registers

DMA Channel and Name	Function
0 Spare	(8-bit transfer)
1 SDLC	(8-bit transfer)
2 Floppy Disk	(8-bit transfer)
3 Spare	(8-bit transfer)
4 DMA controller	1 cascade
5 Spare	(16-bit transfer)
6 Spare	(16-bit transfer)
7 Spare	(16-bit transfer)

Page Register	I/O Address (HEX)
DMA Channel 0	0087
DMA Channel 1	0083
DMA Channel 2	0081
DMA Channel 3	0082
DMA Channel 4	Reserved
DMA Channel 5	008B
DMA Channel 6	0089
DMA Channel 7	008A
Refresh	008F

Appendix H: Swan Warranty Information

Customer satisfaction is the primary goal of Swan Technologies --not only with our computer products but with the service we provide for each order at the time it is made and afterwards.

You may need to contact Swan for information about or assistance with the items you have received. We have a full-time staff of factory-trained technicians qualified to answer all Swan product questions and to assist you if you decide to return any item(s) you have received.

Information about your customer satisfaction guarantee, your Swan warranty, our customer service policies, and supporting procedures is covered in this appendix. We request that you carefully read the following information regarding our policies for returning merchandise for either warranty service or credit.

Provided with your system is a warranty summary which describes the services covered by your warranty, as well as how to obtain service. Please keep this summary with your important papers, so that you can access this information if service is required.

_____

Customer Satisfaction Guarantee:

We want you to be satisfied with every aspect of your EISA DB system. All Swan computers carry a 30-day money-back customer satisfaction guarantee, so that you may evaluate your system in your own office environment.

The 30-day time period begins when your computer is operating properly. For example, if the computer and the monitor are separated in shipping, and the monitor arrives a week later than the computer, the trial period would start from the ship date of the monitor.

In the event a serviceable part fails during the first 30 days, a new 30-day trial period would begin when the replacement part is shipped from Swan.

Swan Factory Warranty:

Your computer carries a one-year warranty covering the cost of parts and labor necessary for its repair. Please see your Swan warranty sheet for more details. If, after speaking with one of our technicians, it becomes clear that service is necessary, several courses of action are available, depending on the situation.

If a component of the computer fails, such as a video card, you may remove the defective part and return it. The part would be repaired or replaced and shipped back to you. Although you must pay for shipping to us, we pay for the shipping of the part back to you.

If down time must be held to a minimum, you may elect to purchase a replacement part, and, after installing it in your system, return the defective part for a refund. (Note: This replacement policy does not extend to hard drives after the 30-day satisfaction guarantee period.) If you choose this route, you must in effect pay for shipping both ways, since the refund is for the total amount of merchandise. Services such as expedited shipping are non-refundable.

If you prefer not to open your machine, you may elect to simply let Swan Technologies worry about it and ship the entire system to us for repair. You would be responsible for the cost of shipping to us, while Swan pays for the return shipping.

Swan On-Site Service Warranty:

Swan systems that carry a standard on-site service contract are covered for one year from the date of purchase. Please see your Swan warranty sheet.   If, after speaking with one of our technicians, it becomes clear that service is necessary, several courses of action are available, depending on the situation.

If a component of the computer fails, such as a video card, a replacement part will be shipped to you. Generally, the part will arrive the next business day. Arrangements will be made to have the defective component picked up and returned to Swan Technologies at no charge to you.

If you prefer not to replace a suspect component yourself, an on-site service technician can be dispatched to perform the work. The Swan technician will discuss the situation with you and determine if on-site service is needed. If appropriate, an on-site technician from your area

will contact you to make an appointment for a service call. The on-site technician will be responsible for returning the service parts to Swan Technologies. Complete instructions are provided in all Swan on-site service kits.

Obtaining Assistance:

If you have a question about your Swan computer, or if you think your computer may require servicing, call Swan Technologies' Technical Services Department for assistance.

To facilitate your call and to provide the most accurate information, please have the following available**:**

❏ Your computer--call from a telephone near your computer, and if possible, turn it on before calling. You may be asked to enter a command at the keyboard, reboot, or try other steps that are possible only at the computer itself.

❏ Your customer number or invoice.

❏ This manual.

❏ The type and version of operating system you are using.

❏ The contents of your CONFIG.SYS and AUTOEXEC.BAT files.

❏ A list of the peripherals you are using and manuals for these devices.

❏ A list of any expansion cards you have added to the computer and the manuals for these cards.

❏ A list of the software you are running, including their version number, and manuals for these programs.

> **Note:** In some cases, you may be asked for the product registration number of the software or directed to refer to specific pages of the product manual. *Unauthorized or illegal copies of software are not supported.* If your questions concern specific software, please call the software manufacturer first.

❏ A complete description of the problem you have encountered --write down any error messages you are getting and when they occur. It is important to know what you were doing when the error occurred.

❏ A complete description of what steps you have taken to attempt to resolve the problem and how these steps affected the problem.

Contacting Technical Support:

Swan Technologies may be reached toll-free at **(800)468-9044**. When your call is answered, ask to speak with your salesperson. The sales consultants at Swan are very knowledgeable and may have the information you need. If they are unable to advise you, your call will be forwarded to the Technical Services Department for assistance. The Technical Services Department is open between the hours of 9 a.m. and 9 p.m. (Eastern Time) Monday through Friday, and 9 a.m. to 5 p.m. on Saturday and Sunday.

Returning Items For Factory Repair, Credit or Refund:

Should you find it necessary to return any of the Swan merchandise you have received, please contact Technical Services for a Return Authorization (**RA**) number. Please have your invoice when you call.

All returns, whether for repair or credit, should be prepared for shipping as follows:

❏ The RA number must be clearly written on the exterior of the original box in which the equipment was delivered. Boxes that do bear an RA number are returned.

❏ A photocopy of your invoice and a letter describing the reason for return must be enclosed in each box returned. (Please keep the original invoice for your records.)

❏ If the return is for credit or refund, include all accessories that were included with the item(s) being returned (diskettes, power cords, cables, manuals, etc.).

❏ The returned merchandise must be packed in the original packing materials. If the items arrived in two boxes, please return them double-boxed. Please mark only the exterior box with address and return information.

❏ The returned merchandise should be shipped to:

Swan Technologies
3075 Research Drive
State College, PA 16801

Attention: Returns   RA Number _____

❏ The purchaser is responsible for return shipping expenses as well as for insuring any item returned and assumes the risk of loss during shipping to Swan Technologies. C.O.D. packages are not accepted.

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Refunds

In the event of a return for refund, Swan will issue either a check or a credit to your credit card, depending on the method used to purchase the computer. The amount of refund is the total purchase price of merchandise returned, provided the product is returned in like-new condition, including original documentation and packaging. While no service or re-stocking fees are assessed, fees for services rendered, such as shipping or securing approval on a credit card, are not refundable.

The refund is issued by the accounting department after the returned merchandise has been inspected by Swan Technologies. The whole process typically takes 10 to 21 days from Swan's receipt of the returned merchandise.

Exceptions:

There are several cases in which special consideration is necessary. They are:

Product Damaged During Shipping:
In the event a product is damaged during shipping, you must call Swan and ask for the Customer Service department. We will notify the shipping agency (**carrier**) which delivered the parcel, and it will send out a representative to inspect the box, at which time the carrier may pick up the parcel and issue a Lost/Damaged/Incomplete (**LDI**) claim to Swan. Swan ships a replacement product when the LDI paperwork is received from the carrier.

> **Important**: Do not allow the carrier to pick up the parcel without issuing a receipt.

Product is Dead On Arrival (**DOA**):
If a product other than a CPU is DOA, Swan arranges for the defective product to be picked up and ships a replacement product at no expense to you (provided you are in the continental United States). This is accomplished by issuing a Call Tag through UPS. If you decline this service, and wish to expedite return shipping to us by another carrier, you may do so at your own expense. The return product is still shipped to you without charge. Unless you have an on-site service system warranty, it is NOT possible to cross-ship--the DOA product must be returned before a replacement is shipped.

Purchase Orders
When you call Technical Services, please immediately inform the technician that the system was purchased with a PO. Then, after getting the details from our technician, inform your company's purchasing officer of the situation, and instruct your purchasing officer to call Swan's Accounts Receivable department to complete the necessary paperwork involved with a PO. The RA is necessary for this call.

Defective Peripherals

Peripherals, such as monitors and printers, are covered by the manufacturer's original warranty. Warranty service for such products are determined by the original manufacturer's policy. Swan does not assume the responsibilities of these warranties, nor is Swan an authorized service center for any products other than those produced by Swan Technologies.

In the event of difficulty with a peripheral from another manufacturer, we still request that you call Swan first, since we may, depending on the manufacturer, be able to expedite service for you.

Some manufacturers, such as Magnavox and Panasonic, have their own outstanding service departments, and request that the customer deal directly with them. Please read the product's warranty information before calling Swan's Technical Service Department.

Appendix I: BIOS Errors and Messages

After you enter any Setup information, you should reboot the system. The Setup summary and system information will appear on the screen, along with messages. These may include error messages concerning the system or setup.

The BIOS performs various diagnostic tests each time the computer is turned on. If an error is encountered during the start-up tests, you will either hear a few short beeps or a message will be displayed on the screen. If an error is fatal, the system will halt after reporting the error. If an error is non-fatal, the process continues after the error is reported.

Table I.1 Fatal Errors Through Beeps

These errors are conveyed through a number of beeps.

Beep Count	Meaning
1	DRAM refresh failure
2	Base 64 KB RAM failure
4	System timer failure
5	Processor failure
6	Keyboard controller-GATE A20 error
7	Virtual mode exception error
9	ROM-BIOS checksum failure

Table I.2 Non-Fatal Errors Through Beeps

These errors are conveyed as one long beep followed by several short beeps.

Beep Count	Meaning
3	Conventional and extended memory test failure
8	Display test and vertical and horizontal retrace test failure

Table I.3 Fatal Errors Shown in Display

When these errors are displayed, the screen is cleared, except for the error message, followed by "SYSTEM HALTED."

Message	Meaning
CMOS INOPERATIONAL	Indicates failure of CMOS shutdown register test.

8042 GATE-A20 ERROR   Error in getting into protected mode.

INVALID SWITCH MEMORY FAILURE

DMA ERROR   DMA controller page register test failed.

DMA #1 ERROR   DMA Unit 1 register test failed.

DMA #2 ERROR   DMA Unit 2 register test failed.

Non-Fatal Errors in Display

> There are two types of errors in this category:
> 1. Ones that require you to press the F1 key and give you the
>   option of running Setup.
> 2. Ones that require you to press F1 and don't give you the option
>   of running Setup.

Table I.4 Non-Fatal Errors With Setup Option

CMOS battery state low: indicates failure of CMOS battery or failure in the set and checksum tests.

CMOS system option not set: indicates failure of CMOS battery or failure in set and checksum tests.

CMOS checksum failure: indicates CMOS battery low or failure in the set and checksum tests.

CMOS display type mismatch: indicates failure of display verification.

CMOS memory size mismatch: indicates a system configuration and setup failure.

CMOS time & date not set: indicates system configuration verification error and setup error in timer.

Table I.5 Non-Fatal Errors Without Setup Option

CH-2 timer error: indicates channel 2,1,0 timer test failure.

Keyboard error: indicates keyboard test failure.

KB/Interface error: indicates keyboard test failure.

Display switch setting not proper: indicates display type verification error.

Keyboard is locked....Unlock it.

FDD controller error: indicates system configuration verification error in diskette setup.

HDD controller failure: indicates system configuration verification error in hard disk setup.

C:Drive error: indicates hard disk setup error.

D:Drive error: indicates hard disk setup error.

D:Drive failure: indicates hard disk failure.

Appendix J: BIOS Non-Fatal Error Messages

If a non-fatal error occurs during the POST routines, the error messages will appear on the screen in the following format:

> ERROR Message Line 1
> ERROR Message Line 2
> Press <F1> to RESUME

If this happens, note the error message and press <F1> to continue with the boot-up procedure.

Note: If the "Wait for <F1> If Any Error" option in the Advanced CMOS Setup portion of the BIOS SETUP PROGRAM has been set to disabled, the prompt will not appear on the third line.

For most of the error messages, there is no ERROR Message Line 2. Generally, for the messages containing a line 2 ERROR Message, the text will be "RUN SETUP UTILITY." Pressing the <F1> key will invoke the BIOS SETUP PROGRAM.

Following is a description of the error messages.

1. <u>CH-2 Timer Error</u>: Most AT standard system boards include two timers. An error with timer #1 is a fatal error. If an error occurs with timer #2, this error message appears.

2. <u>INTR #1 Error</u>: The interrupt channel #1 has failed the POST routine.

3. <u>INTR #2 Error</u>: The interrupt channel #2 has failed the POST routine.

4. <u>CMOS Battery State Low</u>: There is a battery in your system which is used for storing the CMOS values. You will get this message if this battery appears to be low in power and needs to be replaced.

5. <u>CMOS Checksum Failure</u>: After the CMOS values are saved, a checksum value is generated to provide for error checking. If the previous value is different from the value currently read, this error message appears. To correct this error, you should run the

BIOS SETUP Program.

6. CMOS System Options Not Set: The values stored in the CMOS are either corrupt or nonexistent. Run the BIOS SETUP Program to correct this error.

7. CMOS Display Type Mismatch: The type of video stored in CMOS does not match the type detected by the BIOS. Run the BIOS SETUP Program to correct this error.

8. Display Switch Not Proper: Some systems require that a video switch on the system board be set to either color or mono-chrome, depending upon the type of video you are using. To correct this, shut the system down and set the switch properly.

9. Keyboard is Locked...Unlock It: The keyboard lock on the system is engaged. The system must be unlocked in order to continue the booting process.

10. Keyboard Error: The BIOS has encountered a timing problem with the keyboard. Make sure you have an AMI keyboard BIOS installed in your system. You may also set the "keyboard" option in the BIOS SETUP Program Standard CMOS Setup to "Not Installed," which will cause the BIOS to skip the keyboard POST routines.

11. KB/Interface Error: The BIOS has found an error with the keyboard connector on the system board.

12. CMOS Memory Size Mismatch: If the BIOS finds the amount of memory on your system board to be different from the amount recorded in CMOS, this error message is generated. Run the BIOS SETUP Program to correct this.

13. FDD Controller Failure: The BIOS is not able to communicate with the floppy disk drive controller. Check all appropriate connections after the system is powered off.

14. HDD Controller Failure: The BIOS is not able to communicate with the hard disk drive controller. Check all appropriate connections after the system is powered down.

15. C: Drive Error: The BIOS is not receiving any response from hard disk drive C:. It may be necessary to run the Hard Disk Utility to correct this problem. Also check the type of hard disk selected on the Standard CMOS Setup of the BIOS SETUP Program to see if the correct hard disk type has been selected.

16. D: Drive Error: The same error has occurred with hard drive D:. Follow the same procedure as listed in #15 to correct.

17. C: Drive Failure: The BIOS cannot get any response from the hard disk drive C:. It may be necessary to replace the drive.

18. D: Drive Failure: The same error as #17 has occurred with drive D:.

19. CMOS Time and Date Not Set: Run the Standard CMOS Setup of the BIOS SETUP Program to set the date and time of the CMOS.

20. Cache Memory Bad, Do Not Enable Cache!: The BIOS has found the cache memory to be defective. Call Swan if this message appears.

21. 8042 Gate A-20 Error: The gate-A20 portion of the keyboard controller (8042) has failed to operate correctly. The 8042 chip should be replaced.

22. Address Line Short!: An error has occurred in the address decoding circuitry of the system board.

23. DMA #2 Error: An error has occurred with the second DMA channel on the system board.

24. DMA #1 Error: An error has occurred with the first DMA channel on the system board.

25. DMA Error: An error has occurred with the DMA controller on the system board.

26. No ROM BASIC: This error occurs when a proper bootable sector cannot be found on either the floppy diskette drive A: or the hard disk drive C:. The BIOS will try at this point to run ROM Basic,

and the error message will be generated when the BIOS does not find it.

27. <u>Diskette Boot Failure</u>: The diskette used to boot up in floppy drive A: is corrupt, which means you cannot use it to boot the system. Use another boot diskette and follow the instructions on the screen.

28. <u>Invalid Boot Diskette</u>: The BIOS can read the diskette in floppy drive A:, but it cannot boot the system with it. Use another boot diskette and follow the instructions on the screen.

29. <u>On Board Parity Error</u>: The BIOS has encountered a parity error with some memory installed on the system board. The message will appear as follows:

    ON BOARD PARITY ERROR
    ADDR (HEX) = (XXXX)

    where XXXX is the address (in Hexadecimal) at which the error has occurred. "On Board" means that it is part of the memory attached directly to the system board, as opposed to memory installed via an expansion card in an I/O (BUS) slot.

30. <u>Off Board Parity Error</u>: On Board Parity Error: The BIOS has encountered a parity error with some memory installed in an I/O (BUS) slot. The message will appear as follows:

    OFF BOARD PARITY ERROR
    ADDR (HEX) = (XXXX)

    where XXXX is the address (in Hexadecimal) at which the error has occurred. "Off Board" means that it is part of the memory installed via an expansion card in an I/O (BUS) slot, as opposed to memory attached directly to the system board.

31. <u>Parity Error ????</u>: The BIOS has encountered a parity error with some memory in the system, but it is not able to determine the address of the error.

Section S: The Swan EISA DB System Board

This section describes the functions and settings of the connector, jumper, and resistor network locations on your system board.
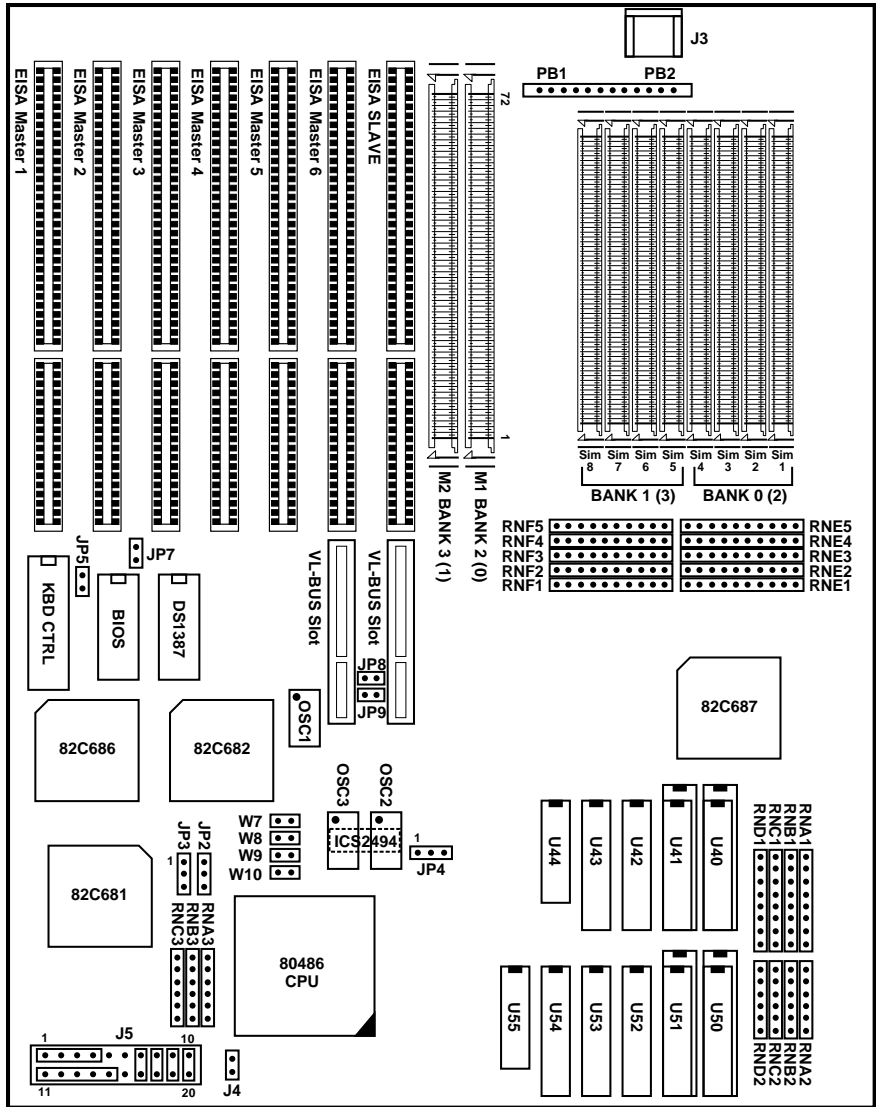
Figure S.1 The System Board

S.1 The Swan EISA DB System Board Jumpers

Table S.1   Jumpers

<u>**Jumper**</u> <u>**Setting**</u>   <u>**Function**</u>

JP5	Video Adapter Selection
closed	Color (CGA, EGA, or VGA) (default)
open	Monochrome
	(Note: If you have more than one video card in your system, this jumper should be set to indicate the primary video. For a videoless application, such as a dedicated file server, it is not necessary to set JP5.)

JP7	CHRDY Generation Selection
closed	EXRDY signal generation
open	Normal operation (default)
	(Note: This jumper, when shorted, accommodates old version EISA cards which use the EXRDY signal to indicate the completion of an ISA slave cycle instead of the normal CHRDY signal.)

JP8	JP9	VL-Bus Speed Selection
open	open	All speeds except 486DX-50 (default)
closed	closed	486DX-50 only

S.2 CPU Selection

When you purchase your Swan EISA DB system, the necessary jumpers will already be configured for the CPU configuration you chose. The only time you would need to change settings for CPU is if you purchase an upgrade processor and perform the upgrade yourself. If you do this, use Table S.2 or S.3 to set jumpers for the new CPU. Then use Table S.4 to set the resistor network for the new CPU. The correct oscillator speed for each CPU is also listed in Table S.2 and S.3.
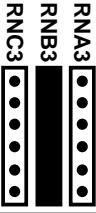
> **Note**: Table S.2 should be used if your motherboard uses a ICS2494 clock generator chip, which is mounted on top of the sockets for OSC2 and OSC3. See Figure S.1 for the location of the clocks. If your motherboard does not contain the ICS2494 clock, use Table S.3 on the next page for proper CPU jumper settings.

Table S.2 Jumper Settings for CPU if Using ICS2492

CPU	JP2	JP3	JP4	W7	W8	W9	W10	OSC1
486SX-25; ODP486SX-25; 487SX-25	1-2	1-2	2-3	open	closed	closed	open	50 MHz
486DX-25; 486DX2-50; ODPR486DX-25	1-2	1-2	2-3	open	closed	closed	open	50 MHz
486DX-33; 486DX2-66; ODPR486DX-33	1-2	2-3	2-3	closed	open	open	open	66 MHz
486SX-33; ODP486SX-33; 487SX-33	1-2	2-3	2-3	closed	open	open	open	66 MHz
486DX-50	2-3	2-3	1-2	open	closed	closed	open	50 MHz

Table S.3 Jumper Settings for CPU if not Using ICS2494								
CPU	JP2	JP3	JP4	W7	W8	W9	W10	OSC1
486SX-25; ODP486SX-25; 487SX-25	1-2	1-2	2-3	open	open	open	closed	50 MHz
486DX-25; 486DX2-50; ODPR486DX-25	1-2	1-2	2-3	open	open	open	closed	50 MHz
486DX-33; 486DX2-66; ODPR486DX-33	1-2	2-3	2-3	open	open	closed	open	66 MHz
486SX-33; ODP486SX-33; 487SX-33	1-2	2-3	2-3	open	open	closed	open	66 MHz
486DX-50	2-3	2-3	1-2	open	open	open	closed	50 MHz

Table S.4 Resistor Connector Setting for CPU Type

CPU Type	RN Setting	RNC3	RNB3	RNA3
486SX	RNC3			
487SX or OverDrive	RNB3			
486DX or 486DX2	RNA3			

S.3 Connectors

Connector J5 is used for six different functions. Figure S.2 shows the connector with pins labelled, and table S.5 lists the functions.
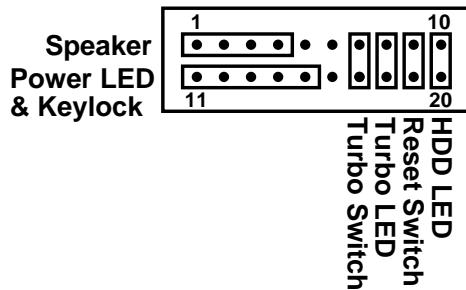
Figure S.2 Connector J5

Table S.5 Connector J5

Pins	Function
1-4	Speaker Connector
11-15	Power LED and Keylock Connector
7&17	Turbo Switch Connector
8&18	Turbo LED Connector
9&19	Reset Switch Connector
10&20	Hard Disk LED In
	(Note: Connector J4, directly adjacent to pins 10&20 of J5, is also used for the hard disk LED for the out connection to the hard disk controller.)

Table S.6 All Connectors

Pins	Function
J3	Keyboard Connector
J4	Hard Disk LED Out
J5	See Table S.5
PB1&PB2	Power Supply Connector

Table S.7 Power Connector Pinout--Connector PB1-PB2

Pin	Description	Color	Pin	Description	Color
1	Power Good	Orange	7	Ground	Black
2	+5 VDC	Red	8	Ground	Black
3	+12 VDC	Yellow	9	-5 VDC	White
4	-12 VDC	Blue	10	+5 VDC	Red
5	Ground	Black	11	+5 VDC	Red
6	Ground	Black	12	+5 VDC	Red

Section T: Troubleshooting

Many computer malfunctions can be corrected or isolated by the steps outlined in this section. If the recommended troubleshooting procedures do not solve the problem, refer to your documentation or call Swan Technologies for technical assistance.

T.1 General Troubleshooting

1. Run the Setup program to verify that the proper configuration information is loaded into your computer.

2. Check to make sure that the computer's power supply has not been interrupted (does the fan run when you turn on your computer?). If not, check the outlet by plugging in a lamp or other electrical device.

3. If the problem is not the power supply, make sure your monitor is connected properly and that the brightness and/or contrast controls are adjusted.

4. Make sure the keylock is unlocked.

5. Turn off your computer. Check all cable connections at the rear of your computer and all power connections.

6. When possible, test the suspected component with another computer (i.e. keyboard, monitor, software).

If you have tried the steps listed above and your computer still does not operate, call Swan Technologies at 800/468-7926 for assistance. Experienced users may prefer to first review the more specific procedures listed below.

T.2 Advanced Troubleshooting

Before starting, remove all power cords and cables from your system, remove the cover (see Chapter 8) and proceed as follows:

1. Make sure that all boards are firmly seated in the appropriate expansion slot on the system board.

2. Make sure that all DIP switches and jumpers on the system board are set for the configuration of your system.

3. Check all power connections to your disk drives.

4. If the computer fails to do anything at all, check the seating of the ROM BIOS chips.

Power Supply Troubleshooting

If the fan starts then stops abruptly when you power up check the following:

1. Make sure the power supply cable is connected properly to the wall outlet and to the rear of your computer.

2. Check the 110/220 switch above the power cord on the back of the computer to be sure it is in the proper position.

3. Remove the cover of the computer. Check the boards inside the unit to be certain they are seated properly on the system board.

4. Make sure that the cables running from the power supply to the system board are seated firmly in their sockets.

5. Make sure the cables from the power supply to the drives are properly seated.

Video Display Troubleshooting

If the system appears to power up correctly but nothing appears on the video display try the following:

1. Check the contrast and brightness controls on the monitor.

2. Make sure the video display cable is connected to the proper port at the rear of your computer.

3. Reseat the video card to be sure it is properly seated in the system board.

4. Be sure the video display and card are compatible. This includes checking that the video card is correctly configured for your monitor.

5. See RAM Troubleshooting.

If the above steps fail, check your Video Manual for further troubleshooting suggestions.

RAM Troubleshooting

When you start your computer, it tests the size of available RAM on the memory board. If nothing appears on your video display at startup, one or more of your SIMM modules may be improperly seated or defective.

See Section S for the location of the SIMM banks on the memory board and examine the modules closely. Make sure all modules are inserted properly and locked into the clips.

Dust or humidity can interfere with the proper contact between a SIMM module and its socket. In this case, the modules look fine, but they do not function properly. Reseating them may solve the problem. See figure 8.9 in chapter 8 for proper SIMM Insertion.

> **Warning**: Reseating SIMM modules is a delicate operation! Proceed at your own risk. SIMMs damaged by improper handling are not covered by your warranty.

To reseat a SIMM module, gently remove it, preferably with an extraction tool. Check the SIMM module for obvious dust. Carefully replace the SIMM, being certain that all contacts line up properly before pressing the SIMM back in place.

Device Troubleshooting

In most instances, a device malfunction is due to improper configuration. You should check your device manual for the proper settings and for troubleshooting guidelines.

> **Note**: A nonfunctioning printer on a computer with two or more parallel ports may not be connected to the primary parallel port.

Listed here are some guidelines for coping with parallel and serial port and device errors. Before you disconnect any cables, always turn off the parallel or serial device and then your computer. When you restore power to your computer, always turn it on before turning on the parallel or serial device.

Parallel port and device problems:

1. Make sure the device is turned on and is on-line.

2. Perform a self-test of the parallel printer. See you printer manual for self-test instructions.

3. Check the I/O cable connecting the device to the parallel port to make sure that it is installed correctly.

4. Substitute your I/O cable with another.

5. If you have more than one parallel port, make sure that they are configured with unique LPT (Local PrinTer) port addresses.

Important: If you have a parallel port on the video card, it is usually set as LPT1 and cannot be configured to another parallel port address; additional ports must be configured as LPT2 and LPT3.

6. Make sure the software is sending data to the correct port.

Serial port and device problems:

1. Make sure the device is turned on. If you are using a serial printer, make sure it is on-line.

2. Make sure the proper I/O cable is correctly installed and fully seated on the connector.

3. Substitute the I/O cable for another.

4. Turn off the serial device and the computer, then remove the case cover. Make sure that the serial port is configured for the proper Interrupt Request Query (**IRQ**) line. COM1 and COM3 are typically assigned to IRQ4; COM2 and COM4 are typically assigned to IRQ3.

5. Make sure the communications parameters (baud rate, parity, data length, and stop bits) are set identically for the serial port and the serial device. See your DOS manual for information about the DOS MODE command.

Keyboard Troubleshooting

If your keyboard is not functioning, try the following:

1. Check for proper connection of the cable to the rear of your system.

2. Be sure the keylock is in the "Unlocked" position.

3. Make sure the switch at the back of the keyboard is shifted to the AT position. Flip the switch several times to be sure the switch is making proper contact.

4. Reset the keyboard controller by turning off power to the computer. Neither the computer's reset button nor <Ctrl><Alt><Del> reset the keyboard controller.

Diskette Drive Troubleshooting

If your computer reports an error in the diskette drive, the following steps may help you isolate the problem:

1. Remove the diskette and make sure that it was inserted properly.

2. Make sure the drive latch (door) is closed; the computer cannot read the disk if the latch is not closed.

3. Make sure the Setup program records in CMOS memory the correct number and type of diskette drives.

4. Turn off the computer, disconnect the power cord, and remove the computer cover.

5. Make sure the power cable is connected to the drive.

6. Check cable connections. The colored edge of the ribbon cable should be connected to the pin 1 side of the connector on the disk drive and the pin 1 side of the controller's connector.

7. Reseat the controller board to check that it is properly seated in its expansion slot on the system board.

8. Make sure the drives are configured properly. Drive Select jumpers on the drives should be set to DS 1.

Hard Drive Troubleshooting

If you encounter an error when operating, installing, or initializing your hard drive, the following steps may help you isolate the problem:

1. Make sure the correct drive type is selected in the Setup program. See Chapter 8 for details.

2. Turn off the computer, disconnect the power cord, and open your computer. Check the connections of the power and ribbon cables.

3. Reseat the controller card to make sure that it is properly seated in its expansion slot on the system board.

4. Make sure all drives are configured properly. The Drive Select (**DS**) jumpers on your drives depend on what type of cable you are using and on the number of drives in your computer.
   If your cable has a single hard drive connector, only one hard drive may be connected to this cable. The drive should be set to DS 0.
   If your cable has two drive connectors, is straight (no twist), and you have one hard drive, the drive should be set to DS 0 and connected to the end of the cable. If you have two drives, the drive at the end of the cable should be set to DS 0 and the drive at the middle of the cable should be set to DS 1.
   If your cable has two drive connectors with a twist between the connectors, all hard drives connected the cable should be set to the same drive select (DS 1 for end drive to be C, DS 0 for middle drive to be C).
   If you are using IDE hard drives, no drive select jumper is needed. However, with more than one IDE drive, the drives

must be properly configured for master and slave, and the master drive's partition made active to allow booting from that drive (see FDISK command in DOS manual).

5. If you have two hard drives, only the drive at the end of the cable should have a terminating resistor.

T.3 Other Error Messages

Troubleshooting With DOS

See your DOS manual for explanations of the three types of error messages you may encounter: MS-DOS utility messages, MS-DOS device error messages, and application program messages.

BIOS Error Messages

A list of error messages is given in Appendix I for the AMI BIOS in this system. Please refer to it if you get a BIOS error message. The BIOS Setup program is outlined in Chapter 8.

A list of hard drive utility error messages is given in Appendix J. The hard drive utility is outlined in Chapter 8.

T.4 EISA Conflicts

If EISA conflicts arise, refer to the EISA Configuration Utility (ECU) documentation which accompanies this manual.

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